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(54) Title: IDENTIFICATION OF TISSUE/CELL SPECIFIC MARKER GENES AND USE THEREOF

(57) Abstract: A cartilage array comprises a plurality of different polynucleotide probe spots stably associated with a solid surface of a carrier, whereby each of said spots is made of a unique polynucleotide that corresponds to one specific cartilage marker gene. Said specific cartilage marker genes preferably are at least in part selected from a group of 467 genes that could be shown to be cartilage related.

Identification of tissue/cell specific marker genes and use thereof

Cross References to Related Applications

This application claims the priority of US provisional patent application 60/388994, filed June 14, 2002, the disclosure of which is incorporated herein by reference in its entirety.

Field of the Invention

The present invention relates to a method for the identification of tissue cell specific marker genes, a method for the determination of a disease state or developmental status of cells/tissue as well as to gene expression profiling of cartilage tissue. More specifically, the invention relates to microarrays containing a plurality of selected human chondrocyte specific sequences and their use for classification of cartilage donor tissue or generation of characteristic gene expression profiles of *in vitro* chondrocyte cultures. Such DNA arrays find use as a standard tool of molecular biology research and clinical diagnostics for all cartilaginous or related tissues.

Background of the Invention

Limitation on current microarray technologies

DNA array technology, also known as biochip or microarray technology, is currently revolutionizing modern biology. In this technology, a biological sample is applied to a glass slide or chip covered with an array of immobilized DNA probes. Sample nucleic acid complementary to specific probes on the array hybridizes and can be detected with high sensitively with automated, computerized detectors. In this manner, hundreds to thousands of different individual hybridization experiments can be performed simultaneously. This allows assays of enormous complexity to be carried out – for example, an analysis of the entire gene expression

profile of a cancer cell – with simplicity unimaginable only a few years ago. As a consequence many patents as well as scientific publications have accumulated during the last years. U.S. 6,194,158 discloses characteristic genes and gene expression useful in screening for, diagnosis of, monitoring of, and therapeutic treatment of brain cancer. U.S. 6,218,122 discloses methods for determining or monitoring the progression of disease states or the efficacy of therapeutic regimens within human patients. U.S. 6'077'673 discloses mouse arrays having a plurality of probe polynucleotides corresponding to a key mouse gene for expression analysis of critical mouse genes. A list of representative scientific papers dealing with monitoring the expression level of a large number of transcripts within a cell at any time are as follows: Schena et al., 1995, Quantitative monitoring of gene expression patterns with a complementary DNA-microarray, Science 270: 467-470; Lockhart et al., 1996, Expression monitoring by hybridization to high-density oligonucleotide arrays, Nature Biotechnology 14:1675-1680; Blanchard et al., 1996, Sequence to array: Probing the genome's secrets, Nature Biotechnology 14:1649. Qi et al., 2003, Identification of genes responsible for osteoblast differentiation from human mesodermal progenitor cells PNAS 18;100(6):3305-10. While this list of scientific papers and patents reflects without any doubt the great potential of microarrays, there are a couple of yet unsolved problems that are more and more discussed among the scientific community. Especially, these problems are data overflow, representative sample collection, RNA processing and inappropriate data analysis. It is even suspected that within next five years, many of conclusions drawn from published data will be revised or refuted. Thus there remains a real and unmet need for advanced microarray solutions, targeted to specific tissues above all with respect to simplification and substantiation of the process of data generation and data handling. With respect to this issue the disclosed invention has made considerable contribution in the cartilage area with a cartilage-specific microarray containing a manageable number of cartilage relevant genes.

Limitation on the number of cartilage relevant genes

Until today the number of cartilage-relevant genes (genes that have been associated a potential functional role on cartilage biology, homeostasis or pathology) is very limited. Approximately, 100-200 genes have been described in the literature in any relationship to cartilage tissue. While existing publications e.g. Heller et al PNAS, 94; 2150-2155; 1997 have described analysis of inflammatory diseases of cartilage and Sekiya et al PNAS 99; 4397-4402; 2001 cartilage formation from stem cells with microarrays, a comprehensive analysis and determination of characteristic gene expression profiles for 2D, 3D, fetal, adult and pathological chondrocytes cell cultures cultivated under different conditions has not been performed up to now. While in patent WO01/24833 A2 a few markers have been determined that are associated with chondorcytes and their phenotype stability, it will not be possible to perform a detailed gene expression analysis and to define specific fingerprints. Therefore the possibility of characterizing culture conditions or cartilage tissue samples can not be thoroughly adressed.

Completion of the human genome first project draft on 2000 has revealed that the human genome comprises ~30000-35000 human genes. Estimates show that the number and type of active genes vary significantly between different tissues and may increase up to a couple of 10000 for complex tissues, e.g. brain. As a consequence, many genes albeit fully sequenced may have yet not been disclosed to be functionally up- or down regulated in cartilage or cartilage derived cells. The inventive approach described herein has made possible to up to now disclose a total of 467 known and additional genes being differentially expressed in a significant and objective manner within chondrocytes or chondrogenic cells.

By means of the already known and additionally found to be cartilage related genes, a strategy to best address and represent chondrocytes cultured under different conditions has been developed in the scope of the present invention.

Summary of the Invention

In a first aspect the present invention relates to a method for the identification of tissue/cell specific marker genes comprising

a) taking tissue and/or cells of at least one developmental stage and/or at least one disease state, and/or

cultivating said tissue and/or cells *in vitro* under at least one culture condition,

b) determination of gene expression profiles of said tissue/cells and/or *in vitro* cultivated tissue/cells and

c) identification of specific marker genes by bioinformatic analysis of said gene expression profiles.

In particular, the first aspect relates to a method for the identification of tissue/cell specific marker genes comprising cultivating tissue/cells of different developmental stages and/or health conditions *in vitro* under different culture conditions, determination of gene expression profiles of said *in vitro* cultivated cartilage tissue and identification of specific marker genes by bioinformatic analysis of said gene expression profiles.

In a preferred embodiment said tissue is selected from the group consisting of fetal tissue, adolescent tissue, adult tissue, healthy tissue, pathological tissue, progenitor cells such as stem cells or cells derived from the same precursor lineage. Preferred culture conditions are 2D and 3D *in vitro* cultures and the gene expression profiles are preferably determined by means of a micro-array. The bioinformatic analysis of said gene expression profiles is preferably done by cluster software such as e.g cluster analysis.

In a preferred embodiment said tissue is cartilage.

A second aspect of the present invention relates to a method for the determination of a disease state or developmental status of cells/tissue or the physiological potential of cells/tissue. Said method comprises establishing a profile of cellular constituents, preferably a gene expression profile, of said cells or tissue, comparison of said resulting gene expression profile with gene expression profiles characteristic for a particular status or physiological potential of the examined cells or tissue.

Said method can e.g be. used to assess the redifferentiation potential of cells or tissue, the assessment of the quality of tissue biopsies for diagnostic and prognostic purposes regarding *in vitro* tissue engineering applications, the assessment of the quality of *in vitro* produced cells such as e.g. mesenchymal cells, stem cells or embryonic cells or of *in vitro* produced tissue for therapeutical applications and for determining the effect of one or more growth factors, media compositions or drugs on cells or tissue. Based on said method it is e.g. possible to set up different *in vitro* culture conditions for cells/tissue allowing the cultivation of cells/tissue which retain their potential for differentiation.

In a preferred embodiment said cells or tissue is cartilage tissue or chondrocytes and the array comprises polynucleotide probes of tissue specifc marker genes.

In a further preferred embodiment said profile is a gene expression profile which is determined by means of a micro-array.

A further object of the present invention is a method for the determination of characteristic profils for clinical use comprising correlating the patient data of the biopsy donor with the gene expression profile of said biopsy cells/tissue. Preferably said gene expression profile has been determined according to the above disclosed method. The resulting profiles of said method are suitable tools in the clinic allowing an evaluation of further treatments of a patient.

The present invention provides characteristic gene expression profiles experimentally determined by using cartilaginous tissues as from individual human donors of various ages (fetal, adolescent, adult) and health conditions (healthy and arthritic) or cells thereof cultivated under different *in vitro* culture conditions (2D and 3D *in vitro* cultures, time follow ups). From these different gene expression profiles a set of hitherto 467 markers has been deduced that can be used to design and produce a cartilage specific microarray for commercial applications in the field of R&D, such as culture media development, drug screening etc., but also for clinical applications.

Gene expression analysis performed with such microarrays and the corresponding analytical procedure thereof can be used to assess quality control of human donor cartilage, e.g. biopsy and therefore optimization of any downstream tissue engineering process, for diagnostic evaluation of the patient and its candidate treatment methods, to ensure a cost-optimized procedure, to investigate and assess all kind of 2D- and 3D *in vitro* cultures performed with human chondrocytes or chondrogenic cells, e.g. stem cells, to screen all kind of drugs, e.g. hormones, growth factors within the above mentioned *in vitro* cultures regarding a potential beneficial effect and quality assessment of *in vitro* produced tissue performed by tissue engineered procedures.

In a further aspect the present invention provides a cartilage array comprising a plurality of different polynucleotide probe spots stably associated with a solid surface of a carrier, whereby each of said spots is made of a unique polynucleotide that corresponds to one specific cartilage marker gene.

A preferred cartilage array of the present invention comprises at least two spots that have different nucleotide sequences but of the same cartilage marker gene, more preferably at least 10 spots indicative for one tissue or cell status, whereby said at least 10 spots can be selected from different sequences of one gene or from different genes or a combination thereof.

In a preferred embodiment said polynucleotides of the array do not cross hybridize under stringent conditions with each other.

In a preferred embodiment of the present invention the cartilage array comprises spots that are indicative for at least two tissue or cell status, preferably 3.

A further preferred inventive cartilage array is an array wherein at least part of the cartilage marker genes are selected from the 467 genes listed in the description, preferably at least 10 %, more preferably at least 50 %, most preferably about 100 %.

A further preferred inventive cartilage array is an array wherein at least part of the cartilage marker genes are selected from a

subgroup of the 467 genes listed in the description, wherein said subgroup consists of the most tissue specific 200 genes.

In another preferred embodiment the status is selected from biopsies and/or 2D cultures and/or 3D cultures of healthy adult, healthy fetal/infant, undesired adult, undesired fetal/infant or progenitor cells like e.g. stem cells or cells derived from the same precursor lineage.

In a further preferred embodiment of the present invention the polynucleotide probes of the cartilage array have a length of at least 10 nucleotides, preferably at least 20 nucleotides. The probes can also have a length of 30 nucleotides, 50 nucleotides or 70 nucleotides. It is as well possible to use PCR derived products produced from cDNA clones.

In a preferred embodiment the carrier of the inventive cartilage array is attached to coated glass, nylon or any other material.

A further object of the present invention is a kit for use in a hybridization assay, wherein said kit comprises a cartilage array of the present invention. In a preferred embodiment said kit comprises reagents for generating a labelled target polynucleotide sample, a hybridization buffer and a wash medium.

Description of the Figures

The present invention will be further understood from the following description with reference to the tables and figures where:

Tab.I shows the determined number of all genes in the corresponding SOM analysis being differentially expressed according to microarray analyses of a variety of *in vitro* chondrocyte cultures according to predefined criteria. From these data sets specific expression profiles can be deduced that are charcterisitc for different cell culture conditions.

Tab.II shows the extracted and reviewed genes deduced from Tab I in order to have only single entry numbers. Since most of these genes have never been described in any relationship to cartilage, they can be considered as novel cartilage marker (positive/negative markers) or key cartilage genes.

Tab III shows a subset of marker genes form Tab. II that has been used for the production of a micro-array. Included is a subset from Tab II and genes known from the literature.

Tab IV shows the results of the analysis of the 467 cartilage specific marker genes.

Tab V shows the samples used in Examples 1, 2 and 3. Human chondrocytes isolated from 4 different donors were proliferated and kept in 3D-like pellet culture for 7 and 14 days resulting in a total number of 12 samples.

Fig.1 shows a classical result from an analysis performed with self-organizing-maps. This software clusters all genes together in sub clusters that show a similar expression profile. The number of marker genes for the corresponding analysis e.g. 2D vs. 3D cultures (see also Tab I) corresponds to the total number of genes in the sub clusters.

Fig 2 shows an example of a graphical presentation of a cluster analysis and viewed by the software treeview. This shows how cells from different origin and potential for *in vitro* cartilage formation are related to each other and allow a clearer classification of the cell sources. Fetal cells clearly produce different gene clusters compared to adult chondrocytes, while failures are characterized by other gene clusters. Furthermore 3D cell cultures analyzed in a time dependent manner from different donors can be distinguished among each other and gene expression profiles will be grouped accordingly.

Fig 3: SOM analysis of all culture conditions and samples described in Example 2 and in Tab V.

Fig 4: SOM analysis for proliferated chondrocytes (t0) only, for the 4 donors. Gene expression pattern corresponding to donor 2 (the second spot from left hand side in every cluster) behaves different in most clusters.

Fig 5: SOM analysis of chondrocytes kept in 3D culture condition for 7 days (t7). Gene expression pattern from donor 3 (the third spot from left hand side in every cluster) is different for example in clusters c2 and c5.

Fig 6 shows self organized maps (SOM) of chondrocytes from same patients of Figures 4 and 5 kept under 3D culture condition for 14 days (t14).

Fig 7: cluster analysis of all culture conditions and samples described in Example 2 and in Tab V. This figure shows a subset of 88 hierarchical clustered genes (rows) and samples (columns) demonstrating similar gene expression behavior of chondrocytes under different culture conditions. For example proliferated cells (#1, #2, #4, #5, #7, #8, #10, #11) can easily be discriminated from cells kept in 3D-like pellet culture for 14 days (3#, 6#, 9#, 12#).

Fig 8: cluster analysis of human aortic fibroblasts vs. chondrocytes. This figure shows a subset of selected clusters of human aortic fibroblasts cells compared to human chondrocytes both kept in 3D pellet cultures for 14 days. The dendrogram in the upper part of the figure shows the ability of CART-CHIP™ 300 microarray described in this invention to discriminate between different cell lines.

Fig 9: cluster analysis of Interleukin-1 treated vs. untreated human chondrocytes. This figure demonstrates a subset of representative gene clusters allowing differentiation between cells treated with Interleukin-1 from untreated cells both kept in 3D pellet cultures as well as for proliferated cells.

Detailed Description of the Invention

Definitions

2D cultures as used in the scope of the present invention are anchorage dependent chondrocyte cultures cultivated on plastic culture devices.

3D cultures as used in the scope of the present invention are chondrocytes cultured in a three dimensional environment, namely either a) scaffold-free, such as small high density pellet cultures (0.25-3.0*10^6 cells) or as high density cultures using 50*10^6 cells/ml or aliquots thereof; or b) by using a synthetic scaffold such as PGA, PLA, or mixtures

thereof or biological substances such as agarose, alginate, chitosan or collagen.

failures as used in the scope of the present invention are chondrocytes cultured in a three dimensional environment that are not able to synthesize new extracellular matrix thereby compromising the production of new living tissue engineered cartilage equivalents.

gene expression profile as used in the scope of the present invention is a profile of genes that are up or down regulated according to different cell conditions.

fingerprint as used in the scope of the present invention refers to a gene expression profile characteristic for a cellular status.

tissue or cell status as used in the scope of the present invention refers to a tissue or cells therof having a certain metabolic or activity status.

new extracellular matrix as used in the scope of the present invention designates living cartilage-like tissue.

micro-array as used in the scope of the present invention is used in its original scope that encompasses embodiments today sometimes refused to as "macro-arrays".

The Invention

The present invention provides cartilage-specific gene arrays as well as methods for their use. In the subject cartilage arrays, a plurality of polynucleotide probe spots are stably associated with the surface of a solid carrier, preferably a surface of a microscope glass slide. Each different polynucleotide probe spot is made of a unique polynucleotide that corresponds to a key cartilage gene of interest. Thus, the subject arrays find particular use in gene expression assays of key cartilage genes. In further describing the subject of the invention, the cartilage specific microarrays are first discussed, followed by a review of representative applications in which the subject arrays may be employed.

Arrays of the Subject Invention-General Description

Selection of novel key cartilage specific genes:

A critical feature of the subject arrays is that all of the probe polynucleotide spots of the array correspond to human key cartilage genes that have been found through unique selection processes and criteria. As a result of said processes, up to now 467 different key human cartilage genes that are under tight transcriptional role have been discovered, some of them being not described before in any relationship to cartilage. In more detail, different microarray analyses were performed by using cartilaginous tissues as from individual human donors of various ages (fetal, adolescent, adult) and health conditions (healthy and arthritic) or cells thereof cultivated under different *in vitro* culture conditions (2D and 3D *in vitro* cultures, time follow ups). This variety of cartilage cell sources and different culture conditions was set up to grasp the highest possible number of genes differentially expressed and thus being indicative of a potential role.

It has been found that specific chondrocyte culture conditions are of great importance for the present invention that discloses a plurality of novel key cartilage genes as well as characteristic and meaningful gene expression patterns. For this reason, the strategy and criteria of the analysed *in vitro* human chondrocyte cultures are described in more detail. The principal experimental setup included both the cultivation of chondrocytes in an anchorage dependent condition, known as 2D cultures for expansion of cells e.g. where the passages is variable but at least more then one, as well as cultivation of chondrocytes in an anchorage independent condition, known as 3D cultures for (re-)differentiation and de novo tissue formation of cells. These are the key steps of any tissue engineering process where autologous tissue equivalents are produced. Since the cell source is either a small biopsy, a small bone marrow aspirate in case of mesenchymal stem cells or other tissue with a limited number of pre-chondrogenic cells, it is first necessary to isolate those cells in order to be able to multiply the cell number drastically. In case of a cartilage biopsy, cells are released from their surrounding extracellular matrix by collagenase digestion and then seeded onto the surface of plastic tissue culture flasks.

The proliferation may take place either in the presence or absence of fetal serum combined with conventional DMEM/F12 medium. Cells can then be passaged by trypsin treatment over several rounds. As a major drawback of this necessary cell expansion, the cells loose their differentiated phenotype and assume a de-differentiated phenotype with altered gene expression. It is further known that with increasing number of passages the state of de-differentiation also advances. As a consequence, genes being transcriptionally upregulated under such artificial culture conditions are cartilage relevant in a manner being indicative of an undesired cellular status. It is also quite common to designate these genes as de-differentiation or negative markers. While healthy tissue in general has been found to re-differentiate in 3D culture after up to 4 passages in 2D cultures, tissue of undesired cellular status cultivated under usual conditions, such as usual culture media, usually does not re-differentiate in 3D culture after at most 4 passages in 2D culture.

Subculture modulated chondrocytes that do not express differentiation markers reexpress the differentiated phenotype in response to the anchorage- independence resulting from various 3D culture models, e.g. high density cultures, agarose or alginate cultures, or cultures within synthetic scaffolds such as made of polyglycolic acid (PGA), polylactic acid (PLA) or mixtures thereof. To set up three dimensional cell cultures the cells are detached after proliferation by trypsin treatment and embedded either in gel-like substances such as alginate, seeded within a porous scaffold such as PGA or cultivated as high-density cultures, only. The time for the analysis may vary and ideally addresses several time points (up to several weeks). Thus 3D *in vitro* chondrocyte cultures support the differentiated phenotype of chondrocytes and can be used to discover cartilage relevant genes or differentiation markers. It should be noted however, that reversibility of the de-differentiation process is dependent on the number of passages and can become irreversible or at least partially irreversible at higher passage numbers (under usual conditions at most about 4 passages). As a rule the time course of de- and re-differentiation are similar. During skeletal development, cartilage serves as a template for

bone formation. Chondrocytes of fetal or infant (< 1 year) or growth plate cartilage pass through different stages and exhibit several distinct phenotypes, such as resting, proliferating, and hypertrophic chondrocytes. Progression through each of these phases is accompanied by profound changes in gene expression patterns. Further, evidence has accumulated that the successful sequence of cartilage repair via tissue engineering recapitulates aspects of embryonic tissue formation. For these reasons, it is important to consider fetal and infant cartilaginous tissue. Cells isolated from human fetal/infant cartilage that are cultivated in 2D and 3D culture systems as described above are especially helpful to understand the mechanisms underlying the phenotypic instability of chondrocytes and the related gene expression patterns. These 2D and 3D culture system may then be analyzed to deduce gene expression profiles and to define marker genes that are characteristic for the (re-)differentiation process. Thus maintenance of chondrocyte-specific phenotype being crucial for normal structure and biomechanical properties of articular cartilage may be better understood and have important implications for modern therapeutic biological applications.

The above mentioned experimental setup for 2D and 3D cultures may be even expanded to compare human adult cells with human fetal/infant chondrocytic cells of age <1 year. The comparison of gene expression profiles of adult versus fetal/infant human chondrocytes during the *in vitro* cartilage formation process is an important aspect since marker genes associated with developmental aspects are revealed. This can be of further interest when 3D cell cultures need to be optimized for their *in vitro* performance for the production of new tissue by e.g. adding growth factors that are found to play a major role during the early onset of cartilage formation *in vivo*.

Another experimental setup found in the scope of this invention includes the *in vitro* culture of cells harvested from cartilaginous areas of arthritic knee joints. Osteoarthritis (OA) results from the failure of chondrocytes within the joint to maintain the balance between synthesis and degradation of extracellular matrix. OA is a multifactorial disorder in

which aging, genetic, hormonal and mechanical factors are all major contributors to its onset and progression. With progressing disease state, the articular chondrocytes ability to maintain homeostasis and functionality is increasingly disappearing. As a consequence, the phenotype of osteoarthritic chondrocytes compared with normal chondrocytes exhibits remarkable changes. Gene expression profiling allows characterization of the osteoarthritic cellular phenotype, a key determinant for understanding and manipulation of osteoarthritic processes. By studying and comparing the gene expression profiles of chondrocytes harvested from pathological and healthy human cartilage areas it becomes possible to identify marker genes that are able to predict the future outcome of cell cultures used for *in vitro* tissue engineering applications. This also relates to the very critical question of the assessment of the quality of the starting biopsy material that is being used for downstream applications like tissue engineering. By having this important information before performing any downstream applications like e.g. proliferation and consecutive 3D *in vitro* tissue formation, the further steps of any process can then be adapted or even not performed at all because of inadequate quality of biopsy material. Such decision may be of high relevance when tissue-engineering processes are transferred or applied in the clinic. Gene expression profiling of chondrocytes may then be used as a diagnostic tool to allow and to choose that therapeutic approach with the most promising clinical outcome.

A further important aspect of the invention is the observation that chondrocytes derived from osteoarthritic patient material always qualify for anchorage dependent proliferation in 2D over several passages. These cells however, if subsequently induced to re-differentiate by culturing them as 3D high density pellets, do not survive over an extended time period, in most cases they die in culture by undergoing apoptosis. It is assumed that these cells, due to an altered phenotype, are not capable of producing the critical survival factors in the appropriate concentrations, above all extracellular matrix components providing intercellular spaces as they occur in native cartilage. Cells that are not suitable to be cultured within 3D high density cultures are herein referred to

as „failures". These impaired cell cultures can be used to set up representative "failure" systems, where cells from different pathological cartilage sources are harvested, proliferated and cultivated in 3D high density pellet culture systems. After each of these experimental steps, RNA can be isolated from the different cell sources and combined to create "failure pools". These failure pools are very well suitable to identify general marker genes being indicative of the onset of osteoarthritis.

For finding cartilage relevant genes, and for determining their presence dependent on the specific cartilage type such as age, health etc., sufficient material must be generated, e.g. by 2D culturing over several passages, and optionally 3D culturing. Said material then can on be subjected to usual gene analyses, and the tissue specific genes determined. Cartillage samples are classified prior to culturing and/or after culturing to get the information needed for later interpretation of the gene expression profile.

A further experimental setup of the current inventions discloses the analysis of chondrocytes grown in 3D cultures isolated from pathological human cartilage and analyzed in a time dependent manner. This experimental set-up allows to study the apoptotic process and to further define additional dynamic and characteristic gene expression profiles, useful for deducing and further assessment of the quality of the biopsy material.

The microarray process and strategy for disclosing all the cartilage relevant genes with the above-mentioned tissues and cell culture criteria will be described in the following. An important issue of the inovative strategy used by the inventors of the present inventions is to use various microarrays containing a high number of genes comprising different functional categories preferentially by representing the whole genome. The broader the microarray regarding the coverage of the human genome the more genes associated with chondrocyte cell cultures can be determined. The chosen strategy of the inventors was not obvious to a person skilled in the art.

RNA isolated from the above mentioned different cell cultures conditions may be radioactive labeled with e.g. 33P or fluorescence like e.g. Cy3 and hybridized to the corresponding filters or microarrays. After hybridization each array may then be scanned and the corresponding signals measured (Tab IV). This raw data file needs then to be calibrated and normalized in a manner to create an input file for the further downstream analysis process. In principle if the data are normalized an expression profile is created. To identify the key cartilage marker genes being differentially expressed under the chosen criteria, tedious bioinformatic analysis are conducted. Corresponding cell cultures and their expression profiles are therefore compared and analyzed accordingly and the different clusters of marker genes determined by software analysis e.g. self-organizing maps (herein referred to as SOM). A representative example of a result for the comparison of different gene expression profiles from different cell culture conditions performed by SOM analysis is given in Fig.1. By performing SOM analysis genes that are similarly expressed are clustered together in so-called sub clusters. The total amount of marker genes for one analysis corresponds to the total amount of sub clusters containing the corresponding genes. Table I in the appendix summarize the results of all the different analysis performed and encompasses all the genes determined for every set of cell culture analysis.

By performing this analytical procedure the analysis reveals several characteristic up and down regulated marker genes for different cellular culture conditions. From these marker genes characteristic expression profiles can then be deduced and used as a benchmark for the comparison or further characterization of other cell cultures.

Hence, on the one hand previously unknown cartilage-relevant genes associated with different culture conditions and on the other hand characteristic gene expression profiles (cellular fingerprints) indicative of a stage of development, a disease state or a particular selected cell culture condition are revealed. These fingerprints are part of the current invention and are of major importance for the classification and

characterization of chondrocytes cultivated under different culture conditions.

Since the gene clusters from all the different analysis contain repetitive gene entries, they have been further processed so that only single entry genes are recorded (see Tab II). This 467 selected sequences are thus all key cartilage genes that are activated and thus differentially expressed according to a stage of development, a disease state or a particular selected cell culture condition and are part of the current invention. A list of all 467 genes with their Pubmed accession no. and a description is given below See also Tables II and III):

List of Table II related sequences:

Pubmed Accesion No	Description
AA283693	Human osteoclast stimulating factor mRNA, complete cds
AA845156	Serine protease inhibitor, Kazal type 1
R52548	Human superoxide dismutase (SOD-1) mRNA, complete cds
T67128	ARYLAMINE N-ACETYLTRANSFERASE, MONOMORPHIC
AA845015	Elastase 1, pancreatic (elastase IIA)
AA937895	Antigen identified by monoclonal antibodies 12E7, F21 and O13
AA844998	Pancreatic polypeptide
AA844818	Amylase, alpha 2A; pancreatic
AA894557	Creatine kinase B
AA872001	Annexin VI (p68)
H09590	Human mRNA for eukaryotic initiation factor 4AI
AA868278	Testis specific protein 1 (probe H4-1 p3-1)
AA490855	Acid finger protein ZNF173
H05820	Human MRL3 mRNA for ribosomal protein L3 homologue (MRL3 = mammalian ribosome L3)
N57766	Agammaglobulinaemia protein-tyrosine kinase atk
AA873885	Alkaline phosphatase, liver/bone/kidney
AA878880	Interferon (gamma)-induced cell line; protein 10 from
R54818	Human eukaryotic initiation factor 2B-epsilon mRNA, partial cds
AA458630	RENIN PRECURSOR, RENAL
W37864	Phosphatase and tensin homolog (mutated in multiple advanced cancers 1)
N63192	Phenylethanolamine N-methyltransferase
R55789	Human X11 protein mRNA, partial cds
R56871	Human chromatin assembly factor-I p60 subunit mRNA, complete cds
AA448659	M-PHASE INDUCER PHOSPHATASE 2
AA235388	Tropomodulin
W37769	Chromogranin B (secretogranin 1)
AA421701	H.sapiens mRNA for MUF1 protein
N81029	Collagen, type XVIII, alpha 1
AA644128	Nuclear autoantigenic sperm protein (histone-binding)
N26536	ATPase, Cu++ transporting, beta polypeptide (Wilson disease)
AA890663	Human protein kinase PAK1 mRNA, complete cds
AA405987	Glycerol kinase 2 (testis specific)
AA888182	Ribosomal protein S4, X-linked
H09730	Adenylate kinase 2 (adk2)
AA285155	CDC46 HOMOLOG
AA873351	Ribosomal protein L35a
H12320	CAMP-RESPONSE ELEMENT BINDING PROTEIN
AA856556	Ribosomal protein S28
R43581	Human guanine nucleotide-binding protein G-s, alpha subunit mRNA, partial cds
AA633768	60S RIBOSOMAL PROTEIN L24
AA496880	Ribosomal protein L5
AA625632	Ubiquitin A-52 residue ribosomal protein fusion product 1
R40850	H.sapiens mRNA for alpha-centractin
AA486072	Small inducible cytokine A5 (RANTES)
N80129	Metallothionein 1L
T67270	UBIQUINOL-CYTOCHROME C REDUCTASE COMPLEX SUBUNIT VI REQUIRING PROTEIN
AA775364	60S RIBOSOMAL PROTEIN L30
AA464743	Ribosomal protein L21
AA663983	Triosephosphate isomerase 1
AA634008	40S RIBOSOMAL PROTEIN S23

AA683050	40S RIBOSOMAL PROTEIN S8
AA775874	60S RIBOSOMAL PROTEIN L18
AA029934	Integrin, alpha V (vitronectin receptor, alpha polypeptide, antigen CD51)
AA872397	GALECTIN-2
AA428195	Protein tyrosine phosphatase, non-receptor type 2
AA478724	Insulin-like growth factor binding protein 6
T40541	H.sapiens mRNA for human giant larvae homolog
N33214	H.sapiens mRNA for membrane-type matrix metalloproteinase 1
W69399	Homo sapiens adenosine triphosphatase mRNA, complete cds
H85454	Homo sapiens delayed-rectifier K+ channel alpha subunit (KCNS1) mRNA, complete cds
T71284	Complement component 1, q subcomponent, beta polypeptide
N95418	Human FK-506 binding protein homologue (FKBP38) mRNA, complete cds
AA430675	Human DNA repair protein XRCC9 (XRCC9) mRNA, complete cds
AA682851	Homo sapiens mRNA for ERp28 protein
AA427433	PROTEIN PHOSPHATASE PP2A, 65 KD REGULATORY SUBUNIT, ALPHA ISOFORM
AA100296	H.sapiens PAP mRNA
AA070997	Proteasome (prosome, macropain) subunit, beta type, 6
R27585	Proteasome component C2
N71628	Spi-B transcription factor (Spi-1/PU.1 related)
AA464566	Human mRNA for LDL-receptor related protein
AA043228	Calponin 3, acidic
AA478273	APEX nuclease (multifunctional DNA repair enzyme)
H05619	Homo sapiens GDNF family receptor alpha 2 (GFRalpha2) mRNA, complete cds
AA405562	Protein phosphatase 4 (formerly X), catalytic subunit
AA147043	Homo sapiens CAGH1a (CAGH1) mRNA, partial cds
AA035384	Homo sapiens mRNA for small subunit of cytochrome b in succinate dehydrogenase complex, complete cds
R60150	Human mRNA for histidyl-tRNA synthetase (HRS)
N64051	Homo sapiens Werner syndrome gene, complete cds
AA405748	SPLICING FACTOR U2AF 65 KD SUBUNIT
AA461110	Homo sapiens growth-arrest-specific protein (gas) mRNA, complete cds
AA845167	ELASTASE IIIA PRECURSOR
AA443118	Homo sapiens mRNA for CD151, complete cds
N92319	Glycoprotein Ib (platelet), beta polypeptide
AA187148	Core-binding factor, beta subunit
AA253413	Friedreich ataxia
AA046701	ATP SYNTHASE LIPID-BINDING PROTEIN P1 PRECURSOR
AA164562	Homo sapiens actin-related protein Arp3 (ARP3) mRNA, complete cds
AA496357	Homo sapiens SKB1Hs mRNA, complete cds
AA180742	TUBULIN ALPHA-4 CHAIN
AA454743	Human protease M mRNA, complete cds
AA437226	Interleukin 10 receptor
AA458849	Homo sapiens placental bikunin mRNA, complete cds
AA504891	Crystallin, alpha B
AA609655	Homo sapiens mRNA for SCP-1, complete cds
AA599158	MULTIFUNCTIONAL AMINOACYL-TRNA SYNTHETASE
AA052932	Homo sapiens casein kinase I gamma 2 mRNA, complete cds
AA789328	Homo Sapiens (clone PK2J) CDC2-related protein kinase (PISSLRE) mRNA, complete cds
AA129537	Human GAP SH3 binding protein mRNA, complete cds
AA486209	Low density lipoprotein-related protein-associated protein 1 (alpha-2-macroglobulin receptor-associated protein 1
H39018	H.sapiens Syt V gene (genomic and cDNA sequence)
AA464217	V-akt murine thymoma viral oncogene homolog 1

T95053	Homo sapiens Rigui (RIGUI) mRNA, complete cds
AA454646	LYMPHOTOXIN-BETA RECEPTOR PRECURSOR
AA448400	Human plectin (PLEC1) mRNA, complete cds
H13691	Major histocompatibility complex, class II, DM beta
AA132086	Homo sapiens RCL (Rcl) mRNA, complete cds
AA488073	Mucin 1, transmembrane
N40945	H.sapiens mRNA for DRES9 protein
R55705	Homo sapiens orexin receptor-1 mRNA, complete cds
H50114	Homo sapiens NMDA receptor mRNA, complete cds
AA452841	Human K-Cl cotransporter (hKCC1) mRNA, complete cds
W73790	IMMUNOGLOBULIN-RELATED 14.1 PROTEIN PRECURSOR
N30302	POSSIBLE GTP-BINDING PROTEIN HSR1
AA291556	Human ras inhibitor mRNA, 3' end
AA598510	Human APRT gene for adenine phosphoribosyltransferase
AA453787	Human TFIIB related factor hBRF (HBRF) mRNA, complete cds
H05655	Human transcriptional activator mRNA, complete cds
AA419177	INTEGRAL MEMBRANE PROTEIN E16
AA458807	Human retinal protein (HRG4) mRNA, complete cds
AA293218	Cleavage stimulation factor, 3' pre-RNA, subunit 2, 64kD
W44860	Human calmodulin mRNA, complete cds
AA629862	Homo sapiens mRNA for smallest subunit of ubiquinol-cytochrome c reductase, complete cds
AA447674	Homo sapiens HIV-Nef associated acyl CoA thioesterase (hNAACTE) mRNA, complete cds
T52484	Nerve growth factor beta
AA496810	Protein kinase C substrate 80K-H
AA486233	G1 to S phase transition 1
AA079775	TYROSINE-PROTEIN KINASE CSK
W73889	Tetranectin (plasminogen-binding protein)
R50337	Solute carrier family 19 (folate transporter), member 1
R55046	MpV17 transgene, murine homolog, glomerulosclerosis
R46821	T-COMPLEX PROTEIN 1, ALPHA SUBUNIT
R87763	Human telencephalin precursor mRNA, complete cds
H69583	Human BTG2 (BTG2) mRNA, complete cds
R56046	Guanine nucleotide binding protein (G protein), alpha z polypeptide
AA922705	Glycogen phosphorylase B (brain form)
AA487571	Surfactant, pulmonary-associated protein C
AA402440	Homo sapiens exportin t mRNA, complete cds
H29521	ATP-binding cassette 3
AA490911	Homo sapiens drp1 mRNA, complete cds
AA486082	Homo sapiens sgk gene
AA678065	2,3-bisphosphoglycerate mutase
R43509	Human Gu binding protein mRNA, partial cds
N57553	Adenosine receptor A2
AA676955	Aplysia ras-related homolog 12
R14692	Human Na/H antiporter (APNH1) mRNA, complete cds
AA488979	Homo sapiens nucleolar protein (MSP58) mRNA, complete cds
AA443630	Aldehyde dehydrogenase 8
AA027840	H.sapiens mRNA for RIT protein
AA456830	Diacylglycerol kinase, alpha (80kD)
AA453015	H.sapiens L23-related mRNA
AA074446	Human GTP cyclohydrolase I feedback regulatory protein gene, complete cds
AA027042	DNA-DIRECTED RNA POLYMERASE II 23 KD POLYPEPTIDE
AA629923	Human mRNA for pM5 protein
AA460830	Homo sapiens (clone mf.18) RNA polymerase II mRNA, complete cds

AA454218	Homo sapiens transcription factor SL1 mRNA, complete cds
AA046523	H.sapiens mRNA for centrin gene
R51346	Human eIF-2-associated p67 homolog mRNA, complete cds
AA029964	Human ataxin-2 related protein mRNA, partial cds
AA489219	DUTP pyrophosphatase
AA043133	Solute carrier family 16 (monocarboxylic acid transporters), member 1
AA812973	Human mRNA for testis-specific TCP20, complete cds
AA453471	GANGLIOSIDE GM2 ACTIVATOR PRECURSOR
AA284693	Transcription factor AP-4 (activating enhancer-binding protein 4)
N90281	Human B7 mRNA, complete cds
AA629542	Brush-1
AA679345	Human BTK region clone ftp-3 mRNA
H37774	Tuberin
T97181	Platelet factor 4
AA454879	Plasminogen activator, urokinase receptor
AA147640	Phosphorylase, glycogen; liver (Hers disease, glycogen storage disease type VI)
AA757429	Human serotonin N-acetyltransferase mRNA, complete cds
AA490991	Homo sapiens HnRNP F protein mRNA, complete cds
AA422058	H.sapiens mRNA for D1075-like gene
N66208	Human (ard-1) mRNA, complete cds
AA630776	Human AP-3 complex delta subunit mRNA, complete cds
AA827287	Human interferon-induced leucine zipper protein (IFP35) mRNA, partial cds
AA488084	Superoxide dismutase 2, mitochondrial
R89715	Protein kinase C, gamma
AA490501	H.sapiens mRNA; UV Radiation Resistance Associated Gene
N32199	Human melanoma antigen recognized by T-cells (MART-1) mRNA
AA434404	DNA primase polypeptide 2A (58kD)
N93686	Aldehyde dehydrogenase 7
AA292676	Human metargidin precursor mRNA, complete cds
AA464417	INTERFERON-INDUCIBLE PROTEIN 1-8U
AA442092	Catenin (cadherin-associated protein), beta 1 (88kD)
AA026644	Transcription factor 3 (E2A immunoglobulin enhancer binding factors E12/E47)
AA481464	Peptidylprolyl isomerase B (cyclophilin B)
T68859	Alpha-2-plasmin inhibitor (alpha-2-PI)
AA699560	Surfeit 1
AA705069	Human mRNA for receptor of retinoic acid
AA457739	Homo sapiens putative OSP like protein mRNA, partial cds
H99843	Homo sapiens mRNA for quinolinate phosphoribosyl transferase, complete cds
AA399410	Signal transducer and activator of transcription 3 (acute-phase response factor)
AA443039	HEAT SHOCK 70 KD PROTEIN 1
AA164440	Human autoantigen pericentriol material 1 (PCM-1) mRNA, complete cds
AA446453	Human mRNA for c-myc binding protein, complete cds
AA280692	Diacylglycerol kinase delta
AA031514	Matrix metalloproteinase 7 (matrilysin, uterine)
R33154	Msh (Drosophila) homeo box homolog 1 (formerly homeo box 7)
AA487452	Human DNA fragmentation factor-45 mRNA, complete cds
AA400329	Human gene for neurofilament subunit M (NF-M)
AA454668	Prostaglandin-endoperoxide synthase 1 (prostaglandin G/H synthase and cyclooxygenase)
AA486393	Cytokine receptor family II, member 4
R52541	unknown EST
AA171613	Homo sapiens carbonic anhydrase precursor (CA 12) mRNA, complete cds
AA235706	Human TATA-binding protein associated factor 30 kDa subunit (taf1l30) mRNA, complete cds
AA668527	Human mucosal addressin cell adhesion molecule-1 (MAdCAM-1) mRNA, complete

	cds
T54144	Homo sapiens homolog of the Aspergillus nidulans sudD gene product mRNA, complete cds
R14080	Calcium modulating ligand
AA609599	Homo sapiens SSX3 (SSX3) mRNA, complete cds
AA489201	H.sapiens mRNA for PHAPI2b protein
R08876	Human 26S proteasome-associated pad1 homolog (POH1) mRNA, complete cds
H46425	H.sapiens Pur (pur-alpha) mRNA, complete cds
R56149	Human putative transmembrane protein (nma) mRNA, complete cds
AA454619	Homo sapiens mRNA for Hic-5, partial cds
H15445	H.sapiens mRNA for SEX gene
AA705225	Myosin, light polypeptide 4, alkali; atrial, embryonic
AA191488	Human high-affinity copper uptake protein (hCTR1) mRNA, complete cds
N64862	Human SLP-76 associated protein mRNA, complete cds
R45413	Human transmembrane 4 superfamily protein (SAS) mRNA, complete cds
R77293	Intercellular adhesion molecule 1 (CD54), human rhinovirus receptor
AA436187	Integrin, alpha M (complement component receptor 3, alpha; also known as CD11b (p170), macrophage antigen alpha polypeptide)
AA676470	H.sapiens IAI.3B mRNA
AA443634	Homo sapiens ubiquitin conjugating enzyme G2 (UBE2G2) mRNA, complete cds
AA664180	Glutathione peroxidase 3 (plasma)
W58658	H.sapiens mRNA for CLPP
H54023	Homo sapiens monocyte/macrophage Ig-related receptor MIR-10 (MIR cl-10) mRNA, complete cds
H73724	Cyclin-dependent kinase 6
T70031	Human neutral amino acid transporter B mRNA, complete cds
AA481758	DNAJ PROTEIN HOMOLOG 1
AA521431	Human profilin mRNA, complete cds
AA446103	ERGIC-53 PROTEIN PRECURSOR
N92646	Immunoglobulin gamma 3 (Gm marker)
AA453789	Protein-tyrosine kinase 7
AA425299	Homo sapiens ezrin-radixin-moesin binding phosphoprotein-50 mRNA, complete cds
AA868929	Troponin T1, skeletal, slow
R60019	Homolog 2 of Drosophila large discs
AA857343	Human putative RNA binding protein (RBP56) mRNA, complete cds
AA481438	Complement component 1 inhibitor (angioedema, hereditary)
AA399674	Human small proline rich protein (sprII) mRNA, clone 1292
T98887	Glucose-6-phosphatase
AA676404	Peptidylprolyl isomerase C (cyclophilin C)
H15747	Human HU-K4 mRNA, complete cds
H16958	Human glyceraldehyde 3-phosphate dehydrogenase mRNA
AA936783	Eukaryotic translation initiation factor 3 (eIF-3) p36 subunit
AA884709	Cytochrome P450 11 beta
H24688	Human SWI/SNF complex 170 KDa subunit (BAF170) mRNA, complete cds
AA884403	Human cardiotrophin-1 (CTF1) mRNA, complete cds
AA404619	5' nucleotidase (CD73)
AA598611	IMMEDIATE-EARLY RESPONSE PROTEIN NOT
H72875	GATA-binding protein 3
H63361	Eukaryotic translation initiation factor 2B (eIF-2B) alpha subunit
R39221	Human MAP kinase mRNA, complete cds
R02346	U1 snRNP 70K protein
R51835	unknown EST
R33031	H.sapiens mRNA for sigma 3B protein
AA412053	CD9 antigen
AA001897	Erythroid alpha-spectrin

W81191	Homo sapiens nucleolar autoantigen No55 mRNA, complete cds
AA430552	Homo sapiens proline-rich Gla protein 2 (PRGP2) mRNA, complete cds
AA394130	Human transducin-like protein mRNA, complete cds
N92864	Human cleavage and polyadenylation specificity factor mRNA, complete cds
AA457123	VALYL-TRNA SYNTHETASE
R43320	Human guanine nucleotide-binding regulatory protein (Go-alpha) gene
AA670430	Glutamate receptor, metabotropic 3
H65066	Visinin-like 1
AA458785	GUANYLATE CYCLASE SOLUBLE, BETA-1 CHAIN
AA485871	H.sapiens mRNA for myosin-I beta
T39411	Human 53K isoform of Type II phosphatidylinositol-4-phosphate 5-kinase (PIPK) mRNA, complete cds
R00855	Homo sapiens 59 protein mRNA, 3' end
H98666	Metallopeptidase 1 (33 kD)
H72028	GELSOLIN PRECURSOR, PLASMA
AA679177	Human follistatin-related protein precursor mRNA, complete cds
N21576	Human mitochondrial 1,25-dihydroxyvitamin D3 24-hydroxylase mRNA, complete cds
AA007419	Human RGP4 mRNA, complete cds
T49657	Homo sapiens TWIK-related acid-sensitive K+ channel (TASK) mRNA, complete cds
N38959	Homo sapiens chaperonin containing t-complex polypeptide 1, beta subunit (Cctb) mRNA, complete cds
R51912	Human somatostatin I gene and flanks
H90415	Breast cancer 1, early onset
H41489	Adaptin, beta 1 (beta prime)
H15456	CALPAIN 1, LARGE
W45415	ELASTASE IIIB PRECURSOR
AA447751	Tyrosine hydroxylase
AA487486	Cyclin D1 (PRAD1; parathyroid adenomatosis 1)
R56604	Cholinergic receptor, nicotinic, alpha polypeptide 4
T65772	pulmonary surfactant protein (SP5)
H15085	ADP-ribosylation factor 4-like
R61295	Human ADP/ATP translocase mRNA, 3' end, clone pHAT8
T61256	H.sapiens KHK mRNA for ketohexokinase, clone pHKHK3a
AA405731	Phosphoenolpyruvate carboxykinase 1 (soluble)
T71879	Complement component C2
R59927	Human mRNA for cytochrome c oxidase subunit VIc
AA496780	Human small GTP binding protein Rab7 mRNA, complete cds
AA176688	Human mRNA for lysosomal sialoglycoprotein, complete cds
AA436163	Homo sapiens Pig12 (PIG12) mRNA, complete cds
AA428778	Human placenta LERK-2 (EPLG2) mRNA, complete cds
AA463225	Bone morphogenetic protein 4
AA485426	Interferon (alpha, beta and omega) receptor 2
W47485	Human sigma receptor mRNA, complete cds
H84982	Human checkpoint suppressor 1 mRNA, complete cds
AA504615	Homo sapiens mRNA for CAB1, complete cds
H94487	Cathepsin E
AA448959	Homo sapiens NADH:ubiquinone oxidoreductase 15 kDa IP subunit mRNA, nuclear gene encoding mitochondrial protein, complete cds
AA070358	Transketolase (Wernicke-Korsakoff syndrome)
AA453401	Human PH-20 homolog (LUCA2) mRNA, partial cds
N66737	Collagen, type II, alpha 1 (primary osteoarthritis, spondyloepiphyseal dysplasia, congenital)
AA666180	Human v-erbA related ear-2 gene
AA857131	Human Tat-SF1 mRNA, complete cds
AA479102	Protein kinase C, beta 1

AA456077	Homo sapiens mRNA for p27, complete cds
R87497	H.sapiens mRNA for 2.19 gene
AA718910	Human tax1-binding protein TXBP181 mRNA, complete cds
AA406269	Nuclear factor I/X (CCAAT-binding transcription factor)
N74623	Insulin-like growth factor 2 (somatomedin A)
H99364	Human chloride channel protein (CLCN7) mRNA, partial cds
AA447684	Small proline-rich protein 1B (cornifin)
AA282301	Homo sapiens nuclear dual-specificity phosphatase (SBF1) mRNA, partial cds
H99588	Human lymphoid nuclear protein (LAF-4) mRNA, complete cds
N53512	Homo sapiens alpha 2 delta calcium channel subunit isoform I mRNA, complete cds
AA683321	Homo sapiens PAR-5 mRNA, probable 5' end
AA608557	Damage-specific DNA binding protein 1 (127 kD)
AA757764	Homo sapiens mRNA for DNA-binding protein, complete cds
AA406064	Homo sapiens testis-specific Basic Protein Y 1 (BPY1) mRNA, complete cds
N54596	Human Krueppel-related zinc finger protein (H-plk) mRNA, complete cds
AA481988	Transcription factor 7 (T-cell specific)
N62394	Gap junction protein, beta 1, 32kD (connexin 32, Charcot-Marie-Tooth neuropathy, X-linked)
N26148	Zinc finger protein 148 (pHZ-52)
AA496678	B-cell CLL/lymphoma 3
AA400973	NEUTROPHIL GELATINASE-ASSOCIATED LIPOCALIN PRECURSOR
AA497027	Human mRNA, clone HH109 (screened by the monoclonal antibody of insulin receptor substrate-1 (IRS-1))
N64508	Homo sapiens podocalyxin-like protein mRNA, complete cds
AA033564	H.sapiens mRNA for DGCR6 protein
AA446108	Endoglin (Osler-Rendu-Weber syndrome 1)
AA159577	Mucin 5, subtype B, tracheobronchial
R36958	unknown EST
AA629808	Ribosomal protein L6
AA482067	Human tazarotene-induced gene 2 (TIG2) mRNA, complete cds
AA669314	ATP synthase, H+ transporting, mitochondrial F1 complex, delta subunit
AA775241	Aldolase A
R73584	Homo sapiens hydroxysteroid sulfotransferase SULT2B1a (HSST2) mRNA, complete cds
H28984	PHOSPHATIDYLSERINE SYNTHASE I
R44202	Homo sapiens catechol-O-methyltransferase (COMT) mRNA, complete cds
W70051	H.sapiens mRNA for M-phase phosphoprotein, mpp9
AA401972	Human RalGDS-like 2 (RGL2) mRNA, partial cds
AA236164	CATHEPSIN S PRECURSOR
R22412	Platelet/endothelial cell adhesion molecule (CD31 antigen)
AA424804	MULTIDRUG RESISTANCE-ASSOCIATED PROTEIN 1
AA669443	Eukaryotic translation initiation factor 5 (eIF5)
N69689	RAS-RELATED PROTEIN RAB-1A
H24316	AQUAPORIN-CHIP
AA074224	Recoverin
R36571	Human U1 snRNP-specific protein A gene
AA056465	Human 54 kDa protein mRNA, complete cds
AA633811	H.sapiens E4BP4 gene
AA457155	Human zinc-finger protein C2H2-150 mRNA, complete cds
AA459104	60S RIBOSOMAL PROTEIN L13
R40212	Human coatomer protein (HEPCOP) mRNA, complete cds
AA086476	Adenosine monophosphate deaminase 1 (isoform M)
AA663310	Thymidylate synthase
AA455640	Homo sapiens signalosome subunit 3 (Sgn3) mRNA, complete cds
AA496879	Human (clone E5.1) RNA-binding protein mRNA, complete cds

AA085749	Homo sapiens mRNA for ATP binding protein, complete cds
AA425755	Homo sapiens mRNA for leukemia associated gene 1
N52350	H.sapiens mRNA for protein-tyrosine-phosphatase (tissue type: testis)
AA630104	Lipase A, lysosomal acid, cholesterol esterase (Wolman disease)
AA454854	ALPHA-AMYLASE 2B PRECURSOR
W73406	DIHYDROPRYRIDINE-SENSITIVE L-TYPE, SKELETAL MUSCLE CALCIUM CHANNEL GAMMA SUBUNIT
R12802	Human cytochrome bc-1 complex core protein II mRNA, complete cds
AA465355	Homo sapiens mRNA for U3 snoRNP associated 55 kDa protein
AA829383	DUAL SPECIFICITY MITOGEN-ACTIVATED PROTEIN KINASE KINASE 3
AA629189	Keratin 4
AA430512	Homo sapiens cytoplasmic antiproteinase 3 (CAP3) mRNA, complete cds
AA456439	Human homozygous deletion target in pancreatic carcinoma (DPC4) mRNA, complete cds
H27864	SECRETOGRANIN II PRECURSOR
AA644657	MHC class I protein HLA-A (HLA-A28,-B40, -Cw3)
R40460	Homo sapiens phosphatidylinositol 4-kinase mRNA, complete cds
W96058	Human hnRNP H mRNA, complete cds
T72202	Human transcription factor IL-4 Stat mRNA, complete cds
AA598794	Connective tissue growth factor
AA599178	Ribosomal protein L27a
R88247	Adrenergic, beta, receptor kinase 1
T98612	Alpha-1 type 3 collagen
AA454856	Phospholipid hydroperoxide glutathione peroxidase
N67048	Type 3 iodothyronine deiodinase
AA778675	Homo sapiens mRNA for calmegin, complete cds
H51117	Human calmodulin dependent phosphodiesterase PDE1B1 mRNA, complete cds
N36174	5-HYDROXYTRYPTAMINE 2B RECEPTOR
AA777187	Homo sapiens Cyr61 mRNA, complete cds
R09561	Decay accelerating factor for complement (CD55, Cromer blood group system)
R16849	Human HsPex13p mRNA, complete cds
AA884167	ANNEXIN XIII
AA136983	Cadherin 11 (OB-cadherin)
AA488622	Human signal transducing adaptor molecule STAM mRNA, complete cds
AA699427	Fructose-bisphosphatase 1
AA490459	Transcobalamin II
AA626787	Human ras-related C3 botulinum toxin substrate (rac) mRNA, complete cds
N62179	Human methylmalonate semialdehyde dehydrogenase gene, complete cds
N27190	UBIQUITIN CARBOXYL-TERMINAL HYDROLASE ISOZYME L3
AA441895	Human glutathione-S-transferase homolog mRNA, complete cds
AA463924	FACTOR VIII INTRON 22 PROTEIN
N78843	Homo sapiens cyclophilin-33A (CYP-33) mRNA, complete cds
AA629719	Cytochrome c oxidase VIIc subunit
AA464755	Ankyrin 1, erythrocytic
AA459351	H.sapiens sds22-like mRNA
AA488346	MYOSIN LIGHT CHAIN ALKALI, SMOOTH-MUSCLE ISOFORM
AA427899	Human mRNA fragment encoding beta-tubulin. (from clone D-beta-1)
AA453813	H.sapiens mRNA for Gal-beta(1-3/1-4)GlcNAc alpha-2.3-sialyltransferase
AA397824	Dopachrome tautomerase (dopachrome delta-isomerase, tyrosine-related protein 2)
AA633901	Transforming growth factor, beta-induced, 68kD
AA181334	Troponin I (skeletal fast)
AA292410	Clusterin (complement lysis inhibitor; testosterone-repressed prostate message 2; apolipoprotein J)
AA253434	HEAT SHOCK FACTOR PROTEIN 2
AA455056	H.sapiens mRNA for MAP kinase activated protein kinase

R55188	Human pre-T/NK cell associated protein (3B3) mRNA, 3' end
AA465723	Homo sapiens mRNA for protein phosphatase 2C gamma
N49856	SODIUM- AND CHLORIDE-DEPENDENT BETAINE TRANSPORTER
AA455272	H.sapiens mRNA for ITBA1 protein
AA459292	CDC28 protein kinase 1
AA878561	Ubiquitin A-52 residue ribosomal protein fusion product 1
AA772066	Human phosphatidylinositol (4,5)bisphosphate 5-phosphatase homolog mRNA, partial cds
N78621	H.sapiens mRNA for gamma-adaptin
AA291490	H.sapiens mRNA for processing a-glucosidase I
N46828	Homo sapiens mRNA for inositol 1,4,5-trisphosphate 3-kinase isoenzyme, partial cds
AA150487	Alkaline phosphatase, placental (Regan isozyme)
AA282537	MYOCYTE-SPECIFIC ENHANCER FACTOR 2
AA707922	Human mRNA for cone-specific cGMP phosphodiesterase gamma subunit, complete cds
AA443638	Homo sapiens breast cancer-specific protein 1 (BCSG1) mRNA, complete cds
W73892	Human putative tumor suppressor (LUCA15) mRNA, complete cds
N70734	Troponin T2 (cardiac)
H57136	Human phospholemman chloride channel mRNA, complete cds
AA709414	Nidogen (enactin)
W65461	Human protein tyrosine phosphatase mRNA, complete cds
AA436564	Human cellular proto-oncogene (c-mer) mRNA, complete cds
AA029042	Human hSIAH2 mRNA, complete cds
AA427725	Homo sapiens carboxypeptidase Z precursor, mRNA, complete cds
N51280	ADP-ribosylation factor like 1
AA281347	H.sapiens mRNA for MHC class I promoter binding protein
AA402960	Human HLA class III region containing NOTCH4 gene, partial sequence, homeobox PBX2 (HPBX) gene, receptor for advanced glycosylation end products (RAGE) gene, complete cds, and 6 unidentified cds
N98485	Human forkhead protein FREAC-2 mRNA, partial cds
AA490209	H.sapiens mRNA for Sop2p-like protein
W61361	Homo sapiens cytoplasmic antiproteinase 2 (CAP2) mRNA, complete cds
N51018	Biglycan
AA455281	DEFENDER AGAINST CELL DEATH 1
W69471	V-ski avian sarcoma viral oncogene homolog
AA486321	Vimentin
AA458982	Solute carrier family 9 (sodium/hydrogen exchanger), isoform 1 (antiporter, Na+/H+, amiloride sensitive)
AA442095	NEDD-4 PROTEIN
N99003	Active BCR-related gene
AA609284	Homo sapiens mRNA for Eph-family protein, complete cds
AA195036	Human Ro/SSA ribonucleoprotein homolog (RoRet) mRNA, complete cds
AA478268	Human CtBP mRNA, complete cds
AA608583	Homo sapiens mRNA for OTK27, complete cds
AA486435	Homo sapiens mRNA for CDEP, complete cds
AA505045	Human L2-9 transcript of unrearranged immunoglobulin V(H)5 pseudogene
AA487893	TUMOR-ASSOCIATED ANTIGEN L6
AA292226	Homo sapiens creatine transporter mRNA, complete cds
H87106	Homo sapiens T245 protein (T245) mRNA, complete cds
W96450	Human putative tRNA synthetase-like protein mRNA, complete cds
N33331	Human peroxisome proliferator activated receptor mRNA, complete cds
AA405800	Dodecenoyl-Coenzyme A delta isomerase (3,2 trans-enoyl-Coenzyme A isomerase)
T51539	Macrophage stimulating 1 (hepatocyte growth factor-like)
N59764	Human guanosine 5'-monophosphate synthase mRNA, complete cds
AA521346	H.sapiens mRNA for Ndr protein kinase

AA428551	Homo sapiens SOX22 protein (SOX22) mRNA, complete cds
AA489383	Bone morphogenetic protein 2
AA490172	Collagen, type I, alpha-2
AA504477	Human cytoskeleton associated protein (CG22) mRNA, complete cds

List of Table III related sequences:

Accession_ mrgd	NAME	Gene
M98539	Human prostaglandin D2 synthase gene, exon 7	
AB004922	Homo sapiens gene for Smad 3, exon 1, partial sequence	
AB006000	Homo sapiens mRNA for chondromodulin-I precursor, complete cds	
AB017364	Homo sapiens mRNA for frizzled-2, complete cds	
AB020236	Homo sapiens gene for ribosomal protein L27A, complete cds	Ribosomal protein L27a
AB042820	Homo sapiens RPL6 gene for ribosomal protein L6, complete cds	Ribosomal protein L6
AB043547	Homo sapiens gene for SMAD4, partial cds	
AB080265	Homo sapiens CYP2J2 mRNA for cytochrome P450 2J2, complete cds	Cytochrome P450, subfamily IIJ (arachidonic acid epoxygenase) polypeptide 2
AF000979	Homo sapiens testis-specific Basic Protein Y 1 (BPY1) mRNA, complete cds	Homo sapiens testis-specific Basic Protein Y 1 (BPY1) mRNA, complete cds
AF001450	Homo sapiens core binding factor alpha1 subunit (CBFA1) gene, exon 7 and complete cds	
AF004231	Homo sapiens monocyte/macrophage Ig-related receptor MIR-10 (MIR cl-10) mRNA, complete cds	Homo sapiens monocyte/macrophage Ig-related receptor MIR-10 (MIR cl-10) mRNA, complete cds
AF009801	Homo sapiens homeodomain protein (BAPX1) mRNA, complete cds	
AF010126	Homo sapiens breast cancer-specific protein 1 (BCSG1) mRNA, complete cds	Homo sapiens breast cancer-specific protein 1 (BCSG1) mRNA, complete cds
AF010316	Homo sapiens Pig12 (PIG12) mRNA, complete cds	Homo sapiens Pig12 (PIG12) mRNA, complete cds
AF013591	Homo sapiens homolog of the Aspergillus nidulans sudD gene product mRNA, complete cds	Homo sapiens homolog of the Aspergillus nidulans sudD gene product mRNA, complete cds
AF037204	Homo sapiens RING zinc finger protein (RZF) mRNA, complete cds	
AF043339	Homo sapiens macrophage inflammatory protein 1 alpha (MIP1a) mRNA, partial cds	
AF049656	Homo sapiens inducible nitric oxide synthase (INOS) mRNA, complete cds	
AF072872	Homo sapiens frizzled 1 mRNA, complete cds	
AF188285	Homo sapiens bone morphogenetic protein 9 (BMP9) mRNA, complete cds	
AF189279	Homo sapiens group IIE secretory phospholipase A2 mRNA, complete cds	
AF248634	Homo sapiens syndecan 3 (SDC3) mRNA, complete cds	
AF304431	Homo sapiens hypoxia-inducible factor 1 alpha subunit (HIF1A) mRNA, complete cds	

AF339054	Homo sapiens BCL2-associated X protein (BAX) gene, exons 1, 2 and partial cds	
AF348700	Homo sapiens ubiquitin A-52 residue ribosomal protein fusion product 1 (UBA52), mRNA, complete cds	Ubiquitin A-52 residue ribosomal protein fusion product 1
AF395008	Homo sapiens interleukin 4 (IL4) gene, complete cds	
AF405705	Homo sapiens matrix metalloproteinase 3 (stromelysin 1, progelatinase) (MMP3) gene, complete cds	
AF411526	Homo sapiens nerve growth factor beta (NGFB) mRNA, complete cds	Nerve growth factor beta
AF469046	Homo sapiens macrophage migration inhibitory factor (MIF) mRNA, complete cds	
AF477981	Homo sapiens osterix mRNA, complete cds	
AJ279016	Homo sapiens mRNA for chondrocyte expressed protein 68 kDa (CEP-68 gene)	
AY043326	Homo sapiens keratin 4 (KRT4) gene, complete cds	Keratin 4
AY044847	Homo sapiens aggrecanase 1 (ADAMTS4) gene, complete cds	
D13748	Human mRNA for eukaryotic initiation factor 4AI	Human mRNA for eukaryotic initiation factor 4AI
D38255	Homo sapiens mRNA for CAB1, complete cds	Homo sapiens mRNA for CAB1, complete cds
D45399	Human mRNA for cone-specific cGMP phosphodiesterase gamma subunit, complete cds	Human mRNA for cone-specific cGMP phosphodiesterase gamma subunit, complete cds
D49738	Human cytoskeleton associated protein (CG22) mRNA, complete cds	Human cytoskeleton associated protein (CG22) mRNA, complete cds
D49835	Homo sapiens mRNA for DNA-binding protein, complete cds	Homo sapiens mRNA for DNA-binding protein, complete cds
D90040	Human mRNA for arylamine N-acetyltransferase (EC 2.3.1.5)	ARYLAMINE N-ACETYLTRANSFERASE, MONOMORPHIC
J00306	Human somatostatin I gene and flanks	Human somatostatin I gene and flanks
J03191	Human profilin mRNA, complete cds	Human profilin mRNA, complete cds
J03592	Human ADP/ATP translocase mRNA, 3' end, clone pHAT8	Human ADP/ATP translocase mRNA, 3' end, clone pHAT8
J04111	Human c-jun proto oncogene (JUN), complete cds, clone hCJ-1	
J04177	Human alpha-1 type XI collagen (COL11A1) mRNA, complete cds	
J04973	Human cytochrome bc-1 complex core protein II mRNA, complete cds	Human cytochrome bc-1 complex core protein II mRNA, complete cds
J05036	Human cathepsin E mRNA, complete cds	Cathepsin E
K00065	Human superoxide dismutase (SOD-1) mRNA, complete cds	Human superoxide dismutase (SOD-1) mRNA, complete cds
K00650	Human fos proto-oncogene (c-fos), complete cds	
L05095	Homo sapiens ribosomal protein L30 mRNA, complete cds	60S RIBOSOMAL PROTEIN L30
L08895	Homo sapiens MADS/MEF2-family transcription factor (MEF2C) mRNA, complete cds	
L10347	Human pro-alpha1 type II collagen (COL2A1) gene exons 1-54, complete cds	
L11566	Homo sapiens ribosomal protein L18 (RPL18) mRNA, complete cds	60S RIBOSOMAL PROTEIN L18

L13286	Human mitochondrial 1,25-dihydroxyvitamin D3 24-hydroxylase mRNA, complete cds	Human mitochondrial 1,25-dihydroxyvitamin D3 24-hydroxylase mRNA, complete cds
L13463	Human helix-loop-helix basic phosphoprotein (G0S8) mRNA, complete cds	
L13616	Human focal adhesion kinase (FAK) mRNA, complete cds	
L13720	Homo sapiens growth-arrest-specific protein (gas) mRNA, complete cds	Homo sapiens growth-arrest-specific protein (gas) mRNA, complete cds
L22009	Human hnRNP H mRNA, complete cds	Human hnRNP H mRNA, complete cds
L28997	Homo sapiens ARL1 mRNA, complete cds	ADP-ribosylation factor like 1
L31409	Homo sapiens creatine transporter mRNA, complete cds	Homo sapiens creatine transporter mRNA, complete cds
L33930	Homo sapiens CD24 signal transducer mRNA, complete cds and 3' region	
L34059	Homo sapiens cadherin-4 mRNA, complete cds	
L41162	Homo sapiens collagen alpha 3 type IX (COL9A3) mRNA, complete cds	
L47647	Homo sapiens creatine kinase B mRNA, complete cds	Creatine kinase B
M13994	Human B-cell leukemia/lymphoma 2 (bcl-2) proto-oncogene mRNA encoding bcl-2-alpha protein, complete cds	
M14144	Human vimentin gene, complete cds	Vimentin
M14631	Human guanine nucleotide-binding protein G-s, alpha subunit mRNA, partial cds	Human guanine nucleotide-binding protein G-s, alpha subunit mRNA, partial cds
M16652	Human pancreatic elastase IIA mRNA, complete cds	Elastase 1, pancreatic (elastase IIA)
M20137	Human interleukin 3 (IL-3) mRNA, complete cds, clone pcD-SR-alpha	
M22636	Human U1 small nuclear ribonucleoprotein 70 kd protein mRNA, complete cds	U1 snRNP 70K protein
M37825	Human fibroblast growth factor-5 (FGF-5) mRNA, complete cds	
M57293	Human parathyroid hormone-related peptide (PTHRP) gene, exons 1A, 1B, 1C, and 2	
M58458	Human ribosomal protein S4 (RPS4X) isoform mRNA, complete cds	Ribosomal protein S4, X-linked
M58525	Homo sapiens catechol-O-methyltransferase (COMT) mRNA, complete cds	Homo sapiens catechol-O-methyltransferase (COMT) mRNA, complete cds
M58549	Human matrix Gla protein (MGP) mRNA, complete cds	
M61877	Human erythroid alpha-spectrin (SPTA1) mRNA, complete cds	Erythroid alpha-spectrin
M62402	Human insulin-like growth factor binding protein 6 (IGFBP6) mRNA, complete cds	Insulin-like growth factor binding protein 6
M65062	Human insulin-like growth factor binding protein 5 (IGFBP-5) mRNA, complete cds	
M65217	Human heat shock factor 2 (HSF2) mRNA, complete cds	HEAT SHOCK FACTOR PROTEIN 2
M76701	Homo sapiens zinc finger protein 35 (ZNF35) gene, exon 1	
M77016	Human tropomodulin mRNA, complete cds	Tropomodulin

M81768	Human Na/H antiporter (APNH1) mRNA, complete cds	Human Na/H antiporter (APNH1) mRNA, complete cds
M84489	Human extracellular signal-regulated kinase 2 mRNA, complete cds	
M84721	Human AMP deaminase (AMPD3) mRNA, complete cds	Adenosine monophosphate deaminase (isoform E)
M87842	Human S-lac lectin L-14-II (LGALS2) mRNA, complete cds	GALECTIN-2
M92934	Human connective tissue growth factor, complete cds	Connective tissue growth factor
M95610	Human alpha 2 type IX collagen (COL9A2) mRNA, partial cds	
M96684	H.sapiens Pur (pur-alpha) mRNA, complete cds	H.sapiens Pur (pur-alpha) mRNA, complete cds
M97676	Homo sapiens (region 7) homeobox protein (HOX7) mRNA, complete cds	
NM_000194	Homo sapiens hypoxanthine phosphoribosyltransferase 1 (Lesch-Nyhan syndrome) (HPRT1), mRNA	
NM_000213	Homo sapiens integrin, beta 4 (ITGB4), mRNA	
NM_000221	Homo sapiens ketohexokinase (fructokinase) (KHK), transcript variant a, mRNA	H.sapiens KHK mRNA for ketohexokinase, clone pHKHK3a
NM_000235	Homo sapiens lipase A, lysosomal acid, cholesterol esterase (Wolman disease) (LIPA), mRNA	Lipase A, lysosomal acid, cholesterol esterase (Wolman disease)
NM_000358	Homo sapiens transforming growth factor, beta-induced, 68kD (TGFBI), mRNA	Transforming growth factor, beta-induced, 68kD
NM_000364	Homo sapiens troponin T2, cardiac (TNNT2), mRNA	Troponin T2 (cardiac)
NM_000537	Homo sapiens renin (REN), mRNA	RENIN PRECURSOR, RENAL
NM_000574	Homo sapiens decay accelerating factor for complement (CD55, Cromer blood group system) (DAF), mRNA	Decay accelerating factor for complement (CD55, Cromer blood group system)
NM_000600	Homo sapiens interleukin 6 (interferon, beta 2) (IL6), mRNA	
NM_000618	Homo sapiens insulin-like growth factor 1 (somatomedia C) (IGF1), mRNA	
NM_000632	Homo sapiens integrin, alpha M (complement component receptor 3, alpha; also known as CD11b (p170), macrophage antigen alpha polypeptide) (ITGAM), mRNA	Integrin, alpha M (complement component receptor 3, alpha; also known as CD11b (p170), macrophage antigen alpha polypeptide)
NM_000711	Homo sapiens bone gamma-carboxyglutamate (gla) protein (osteocalcin) (BGLAP), mRNA	
NM_000962	Homo sapiens prostaglandin-endoperoxide synthase 1 (prostaglandin G/H synthase and cyclooxygenase) (PTGS1), transcript variant 1, mRNA	Prostaglandin-endoperoxide synthase 1 (prostaglandin G/H synthase and cyclooxygenase)
NM_000977	Homo sapiens ribosomal protein L13 (RPL13), transcript variant 1, mRNA	60S RIBOSOMAL PROTEIN L13
NM_000996	Homo sapiens ribosomal protein L35a (RPL35A), mRNA	Ribosomal protein L35a
NM_001012	Homo sapiens ribosomal protein S8 (RPS8), mRNA	40S RIBOSOMAL PROTEIN S8
NM_001025	Homo sapiens ribosomal protein S23 (RPS23), mRNA	40S RIBOSOMAL PROTEIN S23
NM_001064	Homo sapiens transketolase (Wernicke-Korsakoff syndrome) (TKT), mRNA	Transketolase (Wernicke-Korsakoff syndrome)
NM_001127	Homo sapiens adaptor-related protein complex 1, beta 1 subunit	Adaptin, beta 1 (beta prime)

		AP1B1), mRNA
NM_001200	Homo sapiens bone morphogenetic protein 2 (BMP2), mRNA	Bone morphogenetic protein 2
NM_001229	Homo sapiens caspase 9, apoptosis-related cysteine protease (CASP9), transcript variant alpha, mRNA	
NM_001511	Homo sapiens GRO1 oncogene (melanoma growth stimulating activity, alpha) (GRO1), mRNA	
NM_001565	Homo sapiens small inducible cytokine subfamily B (Cys-X-Cys), member 10 (SCYB10), mRNA	Interferon (gamma)-induced cell line; protein 10 from
NM_001632	Homo sapiens alkaline phosphatase, placental (Regan isozyme) (ALPP), mRNA	Alkaline phosphatase, placental (Regan isozyme)
NM_001687	Homo sapiens ATP synthase, H+ transporting, mitochondrial F1 complex, delta subunit (ATP5D), mRNA	ATP synthase, H+ transporting, mitochondrial F1 complex, delta subunit
NM_001718	Homo sapiens bone morphogenetic protein 6 (BMP6), mRNA	
NM_001745	Homo sapiens calcium modulating ligand (CAMLG), mRNA	Calcium modulating ligand
NM_001797	Homo sapiens cadherin 11, type 2, OB-cadherin (osteoblast) (CDH11), transcript variant 1, mRNA	
NM_001844	Homo sapiens collagen, type II, alpha 1 (primary osteoarthritis, spondyloepiphyseal dysplasia, congenital) (COL2A1), transcript variant 1, mRNA	
NM_001912	Homo sapiens cathepsin L (CTSL), mRNA	
NM_001969	Homo sapiens eukaryotic translation initiation factor 5 (EIF5), mRNA	Eukaryotic translation initiation factor 5 (eIF5)
NM_002073	Homo sapiens guanine nucleotide binding protein (G protein), alpha z polypeptide (GNAZ), mRNA	Guanine nucleotide binding protein (G protein), alpha z polypeptide
NM_002094	Homo sapiens G1 to S phase transition 1 (GSPT1), mRNA	G1 to S phase transition 1
NM_002160	Homo sapiens hexabrachion (tenascin C, cytotactin) (HXB), mRNA	
NM_002211	Homo sapiens integrin, beta 1 (fibronectin receptor, beta polypeptide, antigen CD29 includes MDF2, MSK12) (ITGB1), mRNA	
NM_002379	Homo sapiens matrilin 1, cartilage matrix protein (MATN1), mRNA	
NM_002381	Homo sapiens matrilin 3 (MATN3) precursor, mRNA	
NM_002421	Homo sapiens matrix metalloproteinase 1 (interstitial collagenase) (MMP1), mRNA	
NM_002424	Homo sapiens matrix metalloproteinase 8 (neutrophil collagenase) (MMP8), mRNA	
NM_002427	Homo sapiens matrix metalloproteinase 13 (collagenase 3) (MMP13), mRNA	
NM_002591	Homo sapiens phosphoenolpyruvate carboxykinase 1 (soluble) (PCK1), mRNA mRNA carboxykinase 1 (soluble)	Phosphoenolpyruvate carboxykinase 1 (soluble)
NM_002619	Homo sapiens platelet factor 4 (PF4), mRNA	Platelet factor 4
NM_002722	Homo sapiens pancreatic polypeptide (PPY), mRNA	
NM_002738	Homo sapiens protein kinase C, beta 1 (PRKCB1), mRNA	Protein kinase C, beta 1
NM_002903	Homo sapiens recoverin (RCV1), mRNA	Recoverin

NM_003036	Homo sapiens v-ski sarcoma viral oncogene homolog (avian) (SKI), mRNA	V-ski avian sarcoma viral oncogene homolog
NM_003282	Homo sapiens troponin I, skeletal, fast (TNNI2), mRNA	Troponin I (skeletal fast)
NM_003385	Homo sapiens visinin-like 1 (VSNL1),	Visinin-like 1
NM_003395	Homo sapiens wingless-type MMTV integration site family, member 14 (WNT14), mRNA	
NM_004613	Homo sapiens transglutaminase 2 (C polypeptide, protein-glutamine-gamma-glutamyltransferase) (TGM2), mRNA	
NM_004832	Homo sapiens glutathione-S-transferase like; glutathione transferase omega (GSTTLp28), mRNA	Human glutathione-S-transferase homolog mRNA, complete cds
NM_004994	Homo sapiens matrix metalloproteinase 9 (gelatinase B, 92kD gelatinase, 92kD type IV collagenase) (MMP9), mRNA	
NM_004995	Homo sapiens matrix metalloproteinase 14 (membrane-inserted) (MMP14), mRNA	
NM_005038	Homo sapiens peptidylprolyl isomerase D (cyclophilin D) (PPID), mRNA	40 KD PEPTIDYL-PROLYL CIS-TRANS ISOMERASE
NM_005186	Homo sapiens calpain 1, (mu/I) large subunit (CAPN1), mRNA	CALPAIN 1, LARGE
NM_005346	Homo sapiens heat shock 70kD protein 1B (HSPA1B), mRNA	HEAT SHOCK 70 KD PROTEIN 1
NM_005438	Homo sapiens FOS-like antigen 1 (FOSL1), mRNA	
NM_005506	Homo sapiens CD36 antigen (collagen type I receptor, thrombospondin receptor)-like 2 (lysosomal integral membrane protein II) (CD36L2), mRNA	
NM_006289	Homo sapiens talin 1 (TLN1), mRNA	
NM_006988	Homo sapiens a disintegrin-like and metalloprotease (reprolysin type) with thrombospondin type 1 motif, 1 (ADAMTS1), mRNA	
NM_007306	Homo sapiens breast cancer 1, early onset (BRCA1), transcript variant BRCA1-exon4, mRNA	Breast cancer 1, early onset
NM_007352	Homo sapiens elastase 3B, pancreatic (ELA3B), Mrna	ELASTASE IIIB PRECURSOR
NM_014000	Homo sapiens vinculin (VCL), transcript variant meta-VCL, mRNA	
NM_014470	Homo sapiens GTP-binding protein (RHO6), mRNA	
NM_018952	Homo sapiens homeo box B6 (HOXB6), mRNA	
NM_021019	Homo sapiens myosin, light polypeptide 6, alkali, smooth muscle and non-muscle (MYL6), transcript variant 1, mRNA	MYOSIN LIGHT CHAIN ALKALI, SMOOTH-MUSCLE ISOFORM
NM_033150	Homo sapiens collagen, type II, alpha 1 (primary osteoarthritis, spondyloepiphyseal dysplasia, congenital) (COL2A1), transcript variant 2, mRNA	
NM_053056	Homo sapiens cyclin D1 (PRAD1: parathyroid adenomatosis 1) (CCND1), mRNA	Cyclin D1 (PRAD1; parathyroid adenomatosis 1)
NM_080682	Homo sapiens vascular cell adhesion molecule 1 (VCAM1), transcript variant 2, mRNA	
S79854	Homo sapiens type 3 iodothyronine deiodinase mRNA, complete cds	Type 3 iodothyronine deiodinase
S83308	SOX5=Sry-related HMG box gene {alternatively spliced} [human, testis, mRNA, 1473 nt]	
U07424	Human putative tRNA synthetase-like protein mRNA, complete cds	Human putative tRNA synthetase-like protein mRNA, complete cds

U07620	Human MAP kinase mRNA, complete cds	Human MAP kinase mRNA, complete cds
U08023	Human cellular proto-oncogene (c-mer) mRNA, complete cds	Human cellular proto-oncogene (c-mer) mRNA, complete cds
U09303	Human T cell leukemia LERK-2 (EPLG2) mRNA, complete cds	
U09577	Homo sapiens lysosomal hyaluronidase (LUCA2/HYAL2) mRNA, complete cds	Human PH-20 homolog (LUCA2) mRNA, partial cds
U09825	Human acid finger protein mRNA, complete cds	Acid finger protein ZNF173
U13261	Homo sapiens eIF-2-associated p67 homolog mRNA, complete cds	Human eIF-2-associated p67 homolog mRNA, complete cds
U13660	Human cartilage-derived morphogenetic protein 1 (CDMP-1) mRNA, complete cds	
U13991	Human TATA-binding protein associated factor 30 kDa subunit (taf|l30) mRNA, complete cds	Human TATA-binding protein associated factor 30 kDa subunit (taf|l30) mRNA, complete cds
U14966	Human ribosomal protein L5 mRNA, complete cds	Ribosomal protein L5
U14971	Human ribosomal protein S9 mRNA, complete cds	
U15085	Human HLA-DMB mRNA, complete cds	Major histocompatibility complex, class II, DM beta
U16031	Human transcription factor IL-4 Stat mRNA, complete cds	Human transcription factor IL-4 Stat mRNA, complete cds
U16261	Human MDA-7 (mda-7) mRNA, complete cds	
U18299	Human damage-specific DNA binding protein DDBa p127 subunit (DDB1) mRNA, complete cds	Damage-specific DNA binding protein 1 (127 kD)
U20980	Human chromatin assembly factor-I p60 subunit mRNA, complete cds	Human chromatin assembly factor-I p60 subunit mRNA, complete cds
U22409	Human parathyroid hormone/PTH-related peptide receptor (PTH/PTHrP) gene, exon 14 and complete cds	
U23028	Human eukaryotic initiation factor 2B-epsilon mRNA, partial cds	Human eukaryotic initiation factor 2B-epsilon mRNA, partial cds
U23946	Human putative tumor suppressor (LUCA15) mRNA, complete cds	Human putative tumor suppressor (LUCA15) mRNA, complete cds
U24152	Human p21-activated protein kinase (Pak1) gene, complete cds	Human protein kinase PAK1 mRNA, complete cds
U25789	Human ribosomal protein L21 mRNA, complete cds	Ribosomal protein L21
U27699	Human pephBGT-1 betaine-GABA transporter mRNA, complete cds	SODIUM- AND CHLORIDE-DEPENDENT BETAINE TRANSPORTER
U31202	Human noggin (NOGGIN) gene, complete cds, (NOG)	
U32169	Human pro-a2 chain of collagen type XI (COL11A2) gene, complete cds	
U32907	Human p37NB mRNA, complete cds	Human p37NB mRNA, complete cds
U33822	Human tax1-binding protein TXBP181 mRNA, complete cds	Human tax1-binding protein TXBP181 mRNA, complete cds
U37012	Human cleavage and polyadenylation specificity factor mRNA, complete cds	Human cleavage and polyadenylation specificity factor mRNA, complete cds
U38864	Human zinc-finger protein C2H2-150 mRNA, complete cds	Human zinc-finger protein C2H2-150 mRNA, complete cds

U40373	Human cell surface glycoprotein CD44 mRNA, complete cds	
U41517	Human channel-like integral membrane protein (AQP-1) mRNA, clone AQP-1-1656, complete cds	AQUAPORIN-CHIP
U43148	Human patched homolog (PTC) mRNA, complete cds	
U43747	Human frataxin (FRDA) mRNA, complete cds	Friedreich ataxia
U43842	Homo sapiens bone morphogenetic protein-4 (hBMP-4) gene, complete cds	Bone morphogenetic protein 4
U45975	Human phosphatidylinositol (4,5)bisphosphate 5-phosphatase homolog mRNA, partial cds	Human phosphatidylinositol (4,5)bisphosphate 5-phosphatase homolog mRNA, partial cds
U53204	Human plectin (PLEC1) mRNA, complete cds	Human plectin (PLEC1) mRNA, complete cds
U53347	Human neutral amino acid transporter B mRNA, complete cds	Human neutral amino acid transporter B mRNA, complete cds
U59289	Human H-cadherin mRNA, complete cds	
U59423	Human Smad1 mRNA, complete cds	
U63717	Homo sapiens osteoclast stimulating factor mRNA, complete cds	Human osteoclast stimulating factor mRNA, complete cds
U68723	Human checkpoint suppressor 1 mRNA, complete cds	
U70312	Homo sapiens integrin binding protein Del-1 (Del1) mRNA, complete cds	
U72245	Human phospholemman chloride channel mRNA, complete cds	Human phospholemman chloride channel mRNA, complete cds
U75283	Human sigma receptor mRNA, complete cds	Human sigma receptor mRNA, complete cds
U76992	Human Tat-SF1 mRNA, complete cds	Human Tat-SF1 mRNA, complete cds
U80998	Human basic helix-loop-helix DNA binding protein (TWIST) gene, complete cds	
U83460	Human high-affinity copper uptake protein (hCTR1) mRNA, complete cds	Human high-affinity copper uptake protein (hCTR1) mRNA, complete cds
U90547	Human Ro/SSA ribonucleoprotein homolog (RoRet) mRNA, complete cds	Human Ro/SSA ribonucleoprotein homolog (RoRet) mRNA, complete cds
U92268	Homo sapiens mitogen activated protein kinase p38-2 mRNA, complete cds	
U93181	Homo sapiens nuclear dual-specificity phosphatase (SBF1) mRNA, partial cds	Homo sapiens nuclear dual-specificity phosphatase (SBF1) mRNA, partial cds
X00129	Human mRNA for retinol binding protein (RBP)	
X00588	Human mRNA for precursor of epidermal growth factor receptor	
X02910	Human gene for tumor necrosis factor (TNF-alpha)	
X03742	Human gene for L apoferritin exons 1 and 2	
X04412	Human mRNA for plasma gelsolin	GELSOLIN PRECURSOR, PLASMA
X06614	Human mRNA for receptor of retinoic acid	Human mRNA for receptor of retinoic acid

X12794	Human v-erbA related ear-2 gene	Human v-erbA related ear-2 gene
X14420	Human mRNA for pro-alpha-1 type 3 collagen	
X51801	Human OP-1 mRNA for osteogenic protein	
X54412	Human mRNA for alpha1(IX) collagen (long form)	
X55654	Homo sapiens mitochondrial coxII mRNA for cytochrome C oxidase II subunit	
X55764	Human mRNA for cytochrome P-450 (11 Beta)	Cytochrome P450 11 beta
X58399	Human L2-9 transcript of unrearranged immunoglobulin V(H)5 pseudogene	Human L2-9 transcript of unrearranged immunoglobulin V(H)5 pseudogene
X58957	H.sapiens atk mRNA for agammaglobulinaemia tyrosine kinase	Agammaglobulinaemia protein-tyrosine kinase atk
X60188	Human ERK1 mRNA for protein serine/threonine kinase	
X60382	H.sapiens COL10A1 gene for collagen (alpha-1 type X)	
X67337	H.sapiens HPBRII-4 mRNA	H.sapiens HPBRII-4 mRNA
X70683	H.sapiens mRNA for SOX-4 protein	
X71661	H.sapiens ERGIC-53 mRNA	ERGIC-53 PROTEIN PRECURSOR
X74795	H.sapiens P1-Cdc46 mRNA	CDC46 HOMOLOG
X76770	H.sapiens PAP mRNA	H.sapiens PAP mRNA
X78712	H.sapiens mRNA for glycerol kinase testis specific 2	Glycerol kinase 2 (testis specific)
X87237	H.sapiens mRNA for processing a-glucosidase I	H.sapiens mRNA for processing a-glucosidase I
X87342	H.sapiens mRNA for human giant larvae homolog	H.sapiens mRNA for human giant larvae homolog
X92475	H.sapiens mRNA for ITBA1 protein	H.sapiens mRNA for ITBA1 protein
X94216	H.sapiens mRNA for VEGF-C protein	
XM_001306	Homo sapiens solute carrier family 16 (monocarboxylic acid transporters), member 1 (SLC16A1), mRNA	Solute carrier family 16 (monocarboxylic acid transporters), member 1
XM_001316	Homo sapiens adenosine monophosphate deaminase 1 (isoform M) (AMPD1), mRNA	Adenosine monophosphate deaminase 1 (isoform M)
XM_001324	Homo sapiens calponin 3, acidic (CNN3), mRNA	Calponin 3, acidic
XM_001782	Homo sapiens fibromodulin (FMOD), mRNA	
XM_001826	Homo sapiens alkaline phosphatase, liver/bone/kidney (ALPL), mRNA	Alkaline phosphatase, liver/bone/kidney
XM_002321	Homo sapiens glypican 1 (GPC1), mRNA	Glypican 1
XM_003059	Homo sapiens peroxisome proliferative activated receptor, gamma (PPARG), mRNA	
XM_003222	Homo sapiens catenin (cadherin-associated protein), beta 1 (88kD) (CTNNB1), mRNA	
XM_003730	Homo sapiens cytochrome c oxidase subunit VIIc (COX7C), mRNA	Cytochrome c oxidase VIIc subunit
XM_003752	Homo sapiens interleukin 3 (colony-stimulating factor, multiple) (IL3), mRNA	

XM_003913	Homo sapiens integrin, alpha 2 (CD49B, alpha 2 subunit of VLA-2 receptor) (ITGA2), mRNA	
XM_004063	Homo sapiens early growth response 1 (EGR1), mRNA	
XM_006121	Homo sapiens cathepsin D (lysosomal aspartyl protease) (CTSD), mRNA	
XM_009336	Homo sapiens cartilage oligomeric matrix protein (pseudoachondroplasia, epiphyseal dysplasia 1, multiple) (COMP), mRNA	
XM_009915	Homo sapiens leukemia inhibitory factor (cholinergic differentiation factor) (LIF), mRNA	
XM_010702	Homo sapiens cathepsin K (pycnodysostosis) (CTSK), mRNA	
XM_012503	Homo sapiens matrix metalloproteinase 2 (gelatinase A, 72kD gelatinase, 72kD type IV collagenase) (MMP2), mRNA	
XM_012651	Homo sapiens collagen, type I, alpha 1 (COL1A1), mRNA	
XM_015434	Homo sapiens chitinase 3-like 1 (cartilage glycoprotein-39) (CHI3L1), mRNA	
XM_016181	Homo sapiens wingless-type MMTV integration site family, member 5A (WNT5A), mRNA	
XM_017096	Homo sapiens active BCR-related gene (ABR), mRNA	
XM_017384	Homo sapiens matrix metalloproteinase 7 (matrilysin, uterine) (MMP7), mRNA	Matrix metalloproteinase 7 (matrilysin, uterine)
XM_017591	Homo sapiens annexin A6 (ANXA6), mRNA	Annexin VI (p68)
XM_028204	Homo sapiens nuclear factor of kappa light polypeptide gene enhancer in B-cells 1 (p105) (NFKB1), mRNA	
XM_028642	Homo sapiens integrin, alpha 5 (fibronectin receptor, alpha polypeptide) (ITGA5), mRNA	
XM_029245	Homo sapiens collagen, type I, alpha 2 (COL1A2), mRNA	Collagen, type I, alpha-2
XM_029796	Homo sapiens frizzled-related protein (FRZB), mRNA	
XM_031221	Homo sapiens interleukin 1, alpha (IL1A), mRNA	
XM_031288	Homo sapiens aggrecan 1 (chondroitin sulfate proteoglycan 1, large aggregating proteoglycan, antigen identified by monoclonal antibody A0122) (AGC1), mRNA	
XM_031289	Homo sapiens interleukin 8 (IL8), mRNA	
XM_032902	Homo sapiens integrin, alpha 1 (ITGA1), mRNA	
XM_033470	Homo sapiens defender against cell death 1 (DAD1), mRNA	DEFENDER AGAINST CELL DEATH 1
XM_033657	Homo sapiens heparan sulfate proteoglycan 2 (perlecan) (HSPG2), mRNA	
XM_033878	Homo sapiens tissue inhibitor of metalloproteinase 1 (erythroid potentiating activity, collagenase inhibitor) (TIMP1), mRNA	
XM_034023	Homo sapiens regulator of G-protein signalling 4 (RGS4), mRNA	Human RGP4 mRNA, complete cds
XM_034556	Homo sapiens chloride channel 7 (CLCN7), mRNA	
XM_034845	Homo sapiens phosphatase and tensin homolog (mutated in multiple advanced cancers 1) (PTEN), mRNA	Phosphatase and tensin homolog (mutated in multiple advanced cancers 1)
XM_034890	Homo sapiens fibrillin 1 (Marfan syndrome) (FBN1), mRNA	
XM_035662	Homo sapiens cathepsin B (CTSB), mRNA	
XM_035842	Homo sapiens small inducible cytokine A5 (RANTES) (SCYA5), mRNA	Small inducible cytokine A5 (RANTES)
XM_036107	Homo sapiens integrin, beta 2 (antigen CD18 (p95), lymphocyte function-associated antigen 1; macrophage antigen 1 (mac-1) beta subunit)	

	(ITGB2), mRNA	
XM_036175	Homo sapiens collagen, type XVIII, alpha 1 (COL18A1), mRNA	Collagen, type XVIII, alpha 1
XM_037087	Homo sapiens ATP binding protein associated with cell differentiation (APACD), mRNA	Homo sapiens mRNA for ATP binding protein, complete cds
XM_037646	Homo sapiens msh homeo box homolog 2 (Drosophila) (MSX2), mRNA	
XM_037965	Homo sapiens chondroadherin (CHAD), mRNA	
XM_038584	Homo sapiens tissue inhibitor of metalloproteinase 3 (Sorsby fundus dystrophy, pseudoinflammatory) (TIMP3), mRNA	
XM_039094	Homo sapiens SRY (sex determining region Y)-box 9 (campomelic dysplasia, autosomal sex-reversal) (SOX9), mRNA	
XM_040037	Homo sapiens adrenergic, beta, receptor kinase 1 (ADRBK1), mRNA	Adrenergic, beta, receptor kinase 1
XM_040385	Homo sapiens S-adenosylmethionine decarboxylase 1 (AMD1), mRNA	S-adenosylmethionine decarboxylase 1
XM_042153	Homo sapiens biglycan (BGN), mRNA	Biglycan
XM_042664	Homo sapiens nuclear autoantigenic sperm protein (histone-binding) (NASP), mRNA	Nuclear autoantigenic sperm protein (histone-binding)
XM_044120	Homo sapiens fibroblast growth factor receptor 3 (achondroplasia, thanatophoric dwarfism) (FGFR3), mRNA	
XM_045089	Homo sapiens ATPase, Cu++ transporting, beta polypeptide (Wilson disease) (ATP7B), mRNA	ATPase, Cu++ transporting, beta polypeptide (Wilson disease)
XM_045802	Homo sapiens paxillin (PXN), Mrna	
XM_045890	Homo sapiens ADP-ribosylation factor 4-like (ARF4L), mRNA	ADP-ribosylation factor 4-like
XM_045925	Homo sapiens decorin (DCN), mRNA	Decorin
XM_045926	Homo sapiens lumican (LUM), mRNA	
XM_046035	Homo sapiens integrin, alpha L (antigen CD11A (p180), lymphocyte function-associated antigen 1; alpha polypeptide) (ITGAL), mRNA	Integrin, alpha L (antigen CD11A (p180), lymphocyte function-associated antigen 1; alpha polypeptide)
XM_046758	Homo sapiens tensin (TNS), mRNA	
XM_046765	Homo sapiens thymidylate synthetase (TYMS), mRNA	Thymidylate synthase
XM_047231	Homo sapiens fibulin 1 (FBLN1), mRNA	
XM_047719	Homo sapiens transcription factor 7 (T-cell specific, HMG-box) (TCF7), mRNA	Transcription factor 7 (T-cell specific)
XM_047802	Homo sapiens a disintegrin-like and metalloprotease (reprolysin type) with thrombospondin type 1 motif, 5 (aggrecanase-2) (ADAMTS5), mRNA	
XM_048167	Homo sapiens troponin T1, skeletal, slow (TNNT1), mRNA	Troponin T1, skeletal, slow
XM_048201	Homo sapiens metallothionein 1L (MT1L), mRNA	Metallothionein 1L
XM_049177	Homo sapiens vascular endothelial growth factor B (VEGFB), mRNA	
XM_049518	Homo sapiens intercellular adhesion molecule 1 (CD54), human rhinovirus receptor (ICAM1), mRNA	Intercellular adhesion molecule 1 (CD54), human rhinovirus receptor

XM_049534	Homo sapiens amylase, alpha 2A; pancreatic (AMY2A), mRNA	Amylase, alpha 2A; pancreatic
XM_049690	Homo sapiens coatomer protein complex, subunit alpha (COPA), mRNA	Human coatomer protein (HEPCOP) mRNA, complete cds
XM_049864	Homo sapiens colony stimulating factor 3 (granulocyte) (CSF3), mRNA	
XM_049937	Homo sapiens insulin-like growth factor binding protein 4 (IGFBP4), mRNA	
XM_050846	Homo sapiens Indian hedgehog homolog (Drosophila) (IHH), mRNA	
XM_053809	Homo sapiens similar to chondroitin sulfate proteoglycan 2 (versican) (H. sapiens) (LOC153633), mRNA	
XM_054566	Homo sapiens collagen, type VI, alpha 1 (COL6A1), mRNA	
XM_054686	Homo sapiens caspase 3, apoptosis-related cysteine protease (CASP3), mRNA	
XM_055254	Homo sapiens fibronectin 1 (FN1), mRNA	
XM_058069	Homo sapiens matrix metalloproteinase 12 (macrophage elastase) (MMP12), mRNA	
XM_084239	Homo sapiens retinoic acid receptor responder (tazarotene induced) 2 (RARRES2), Mrna	Human tazarotene-induced gene 2 (TIG2) mRNA, complete cds
XM_084263	Homo sapiens cytochrome c oxidase subunit VIc (COX6C), mRNA	Human mRNA for cytochrome c oxidase subunit VIc
XM_084285	Homo sapiens integral membrane protein 2A (ITM2A), mRNA	
XM_085705	Homo sapiens tissue inhibitor of metalloproteinase 2 (TIMP2), mRNA	
XM_086368	Homo sapiens MUF1 protein (MUF1), mRNA	H.sapiens mRNA for MUF1 protein
XM_096277	Homo sapiens collagen, type V, alpha 1 (COL5A1), mRNA	
Y00985	Human mRNA for manganese-containing superoxide dismutase	
Y07566	H.sapiens mRNA for RIT protein	H.sapiens mRNA for RIT protein
Y07570	H.sapiens mRNA for PHAPI2b protein	H.sapiens mRNA for PHAPI2b protein
Y08999	H.sapiens mRNA for Sop2p-like protein	H.sapiens mRNA for Sop2p-like protein
Y12692	Homo sapiens mRNA for WNT11 gene	
Y13936	Homo sapiens mRNA for protein phosphatase 2C gamma	Homo sapiens mRNA for protein phosphatase 2C gamma
Y15227	Homo sapiens mRNA for leukemia associated gene 1	Homo sapiens mRNA for leukemia associated gene 1
Z22865	H.sapiens dermatopontin mRNA, complete CDS	
Z50781	H.sapiens mRNA for leucine zipper protein	
Z50853	H.sapiens mRNA for CLPP	H.sapiens mRNA for CLPP

The current invention also encompasses the process of down compression of previously determined 467 genes to a lower number that is still able to characterize the desired number of different cellular status. At present, for the determination of 7 different cell types or development stages, a minimum of 26 spots of different marker genes are preferred, much preferred about 200 such spots. For full information, at least one spot for each of the presently 467 genes (markers) is preferred. A reduction of spot number can be of relevance e.g. if under certain conditions only a small subset of those genes listed in Tab II is required for analysis e.g. in clinical applications. This down compression can be achieved by determining the ratio of actual to target number of genes and then choosing from each cluster accordingly to the determined ratio the necessary number of genes to fulfill the requirement. This process requires to group the number of genes for each analysis of e.g. Tab. I into representative cluster familys from where representative genes can be selected. Such clusters familys can be determined as shown in Figure 1, namely by grouping clusters together that show a similar expression pattern. For each cluster family a representative number of genes may be choosen according to the compression factor that has been defined. It can easily be seen that for larger clusters like e.g. "A" in Tab I more genes are available to select while in other clusters like e.g. "E" in Tab I less are present. At the end of the process one needs to balance the procedure in order to preserve the characteristics of the expression profile. In order to do so the amount of genes for each analysis should at least be greater than 2 sequences or spots, respectively, of different genes and for the total array at least 30. In order to control such a process classical hierarchical clustering (Stanford) analysis can be performed and checked on graphical presentations like treeview (Stanford). Cluster analysis may group similar expression profiles in families and will allow distinguishing between different cell sources and allows classification of these cell cultures (see Fig. 2). If the cell sources are not properly represented in the cluster analysis it means that the selected marker genes are not balanced.

Example of an cartilage specific micro array structure:

To produce a microarray with printed oligonucleotides sequences of approx. at least 10 mers, peferably at least 25 mers, some sequences of table II need to be further processed. Since some of the determined sequences in Tab II are only expressed sequence tags (herein referred to as EST), they do not correspond to or represent the full-length cDNA. Therefore the EST preferably is BLAST searched with the public database at NCBI and the corresponding full-length cDNA determined. Only by having the correct and full-length cDNA it is possible to design oligomeric sequences that are balanced to each other and minimize any cross reactivity. Exemplary polynucleotide sequences (targets) are provided in the sequence listing of Table III. The cartilage related polynucleotide sequences as e.g. listed in Table III and other polynucleotide sequences known as key cartilage genes from the literature can be immobilized on a substrate and used as hybridizable array elements in a microarray format. Such microarrays can be composed of a subset of oligonucleotides representing e.g. sequences listed on Tab. II but modified to represent only full-length cDNA sequences. The used polynucleotides for the production of such a microarray can either be 50mer or also PCR (polymerase chain reaction) products but at least need to be longer then 10 bases. It should be noted that for microarray production also PCR products from the corresponding determined sequences directly or the full length cDNA can be used and it is not restricted just to oligonucleotides.

Methods to anchor such oligonucleotides or polynucleotides on a solid support are described in literature, together with information on length dependent distances between each oligo or polynucleotides and spots . (see e.g. Principal and Practice, DNA microarrays: gene expression analysis B.Jordan, Springer, 2001)

When polynucleotides are employed as hybridizable array elements in a microarray and depending on the software used, the array elements may be organized in an ordered fashion so that each element is present at a specified location on the substrate. If the array elements are at specified locations on the substrate, the hybridization patterns and

intensities (which together create a unique expression profile) can be interpreted in terms of expression levels of particular genes. This expression profile can then be used and may be correlated with any effect associated with a tissue and/or compound or to be investigated with regard to a specific tissue and/or compound and allows comparison with already existing data.

One of such useful application of using ordered polynucleotides on microarrays is e.g. the comparison of gene expression profiles from a new sample e.g. a tissue biopsy, with already determined characteristic gene expression profiles that are preferably stored in a database. Such stored gene expression profiles are e.g. of major importance if microarrays are applied in the clinic. In this case advantageously a database is set up that stores the corresponding gene expression profiles and advantageously also all patient informations, e.g. history, blood pressure etc. By including all patient data and gene expression profiles in the analysis process and then starting a comparison with an expression profile from a new biopsy, it becomes possible to achieve a stronger correlation with the clinical outcome. This will allow to determine which therapy shall be applied, or even to modify an existing therapy, e.g. to add growth factor x at a concentration y during the *ex vivo* tissue engineering phase. It may also be the case that the biopsy sample will demonstrate a poor gene expression profile that precludes the successful application of a modern therapeutic cell/tissue approach. Such cases would then only qualify for traditional surgical approaches, and hence would not obtain the benefits of the tissue engineering process.

In analogy, the assessment of *in vitro* produced cartilage can also be performed. In the same way as mentioned above cell culture parameters, like e.g. culture media conditions, growth factor concentration, are preferably stored in a data base together with the corresponding gene expression profiles. Comparison of the database entry with new profiles of new samples can then be used to assess the quality of the new *in vitro* produced tissue.

Subject Arrays and their use:

It should be noted that the invention described here is not dependent on any special array format rather than the possibility to select from an extended list of 467 novel key cartilage genes as well as meaningful gene expression patterns. A presently preferred subject array is a novel cartilage specific microarray that includes 187 genes that in the scope of this invention have been determined to be cartilage related and 140 genes that have been connected to cartilage in literature (see also Tab III). Normally, in high-density array procedures up to 10000 genes are usually applied and are not specific for certain applications. As one major general drawback, this results in massive data overflow and impaired data analysis due to difficult data handling and procedures. A preferred array has in its current state a minimal number of 150 genes, presently much preferred at most 333 genes, all of those with demonstrated relevance within cartilage tissue. Another major limitation has become apparent. While the invention WO01/24833 A2 describes a few marker genes associated with cartilage phenotype stability they do not allo w to extensively describe chondrocyte cultures in details. No comprehensive classification of the different cell populations and culture conditions is possible as well as no gene expression profile or fingerprint can be achieved. Gene expression profiles determined with a set of genes represented in Tab II may allow to perform a more comprehensive analysis of different cell cultures conditions. Furthermore it may allow to compare and classify different tissue or the result of the different applied cell culture conditions. The above mentioned topics may only be possible with the disclosed invention as outlined within the following applications.

The inventive array CART-CHIP 300 ™ may be applied to classify (quality control) any source material, such as human cartilage biopsies, mesenchymal stem cell containing bone marrow aspirate, or pre-chondrogenic cells containing tissue according to pre-defined categories with respect to their capacity to re-build or re-organize a hyaline cartilage-like matrix *in vitro*. A rough subdivision could be for example "A", "B", or "C". While "A" will easily produce cartilage-like matrix, "B" will require special treatment to achieve an implantable construct, and "C" will represent those

cases that do yet not qualify for such a procedure. This biopsy classification system will allow:

- Quality control of the starting biopsy material and therefore optimization of the downstream process regarding e.g. *in vitro* tissue engineering applications
- Diagnostic evaluation of the patient and candidate treatment methods (e.g. CARTIGRAFT™) to ensure a cost-optimized procedure
- Quality control of *in vitro* tissue engineered products

The subject array of the present invention can be employed for all kind of research and developmental studies related to *in vitro* tissue engineering of cartilage. The possibility to assess proliferation, differentiation or re-differentiation as well as de novo matrix formation processes through analyses and comparison of a plurality of key cartilage genes (positive/negative markers) within one single experiment replaces current trial and error approaches and is thus far more rational.

The subject array can be applied to screen all kind of drugs, e.g. hormones, growth factors, within *in vitro* chondrocyte cultures regarding a potential beneficial effect on proliferation, differentiation, de novo matrix formation. The deduced expression profiles can then be compared with existing data of e.g. native cartilage tissue and used to further optimize the process. Additionally the expression profiles can be compared with data from human adult and human infant cartilage to deduce a pathway or a strategy of how to induce more tissue formation in vitro.

The subject array of the preferred embodiment is very well suitable to better understand reaction pathways leading to new responses of chondrocytes *in vitro*. Only key cartilage genes comprising the whole spectrum of functional gene categories are to be investigated. This can be used to study the complexity of degenerative cartilage process *in vitro* and the respective influence of potential beneficial drugs.

The subject array may be used to optimize cultures for in vitro cartilage formation starting from human cell sources other than cartilage like e.g. mesenchymal stem cells or bon marrow aspirates.

This subject array will be preferably used as powerful alternative for conventional molecular biology tools beside more established histological and biochemical analyses. By focusing on the most prominent cartilage marker genes being either positive or negative, it is possible to characterize cartilage or cartilage related tissues as well as cell cultures thereof. In this respect, the subject array can replace conventional RT-PCR studies performed to check for cartilage marker gene expression, e.g. collagen I versus collagen II, aggrecan versus versican. By applying this subject array the set of markers will be easily increased by simultaneously simplifying the experimental procedure and enhancing the outcome.

The subject arrays of the present invention have several advantages compared to existing microarrays as well as to conventional gene expression tools such as RT-PCR, Northern Blots etc.

Most importantly, the subject arrays are all based on key cartilage genes. Beyond all the key cartilage genes known from the literature (~100-200 genes), 467 additional cartilage relevant genes have been discovered. Thus a significantly increased pool of cartilage key genes exists to choose from for various applications. For instance, to understand degenerative processes as they occur in OA or RA by study of complex biological reaction pathways, it is important to follow expression of a relatively large number of genes.

Examples

The examples are described for the purposes of illustration and are not intended to limit the scope of the invention.

Example 1: Analysis of various human cartilage samples

Useful for characterizing chondrocyte cultures derived from different human cartilage samples (adult and fetal), where adult samples are different with respect to their capacity to form living tissue engineered equivalents under high density culture conditions.

Adult chondrocytes show different gene expression clusters compared to fetal chondrocytes and can be further distinguished from samples that will not produce living cartilage constructs (failures).

Human chondrocytes from adult and fetal articular cartilage were proliferated in DMEM-F12 medium containing 10% FCS over several passages and transferred to pellet cultures ($0.5*10^6$ cells) in serum free DMEM-F12 medium supplemented with Ascorbate and Insulin medium. Proliferated cells were directly lyzed with RLT buffer (RNeasy® Mini Kit, Qiagen) after trypsin release from plastic substrate, shredded (QIAshredder, Qiagen) and kept frozen at -80°C in lysis buffer for later processing. High density pellet cultures were cultivated for 2 weeks if not otherwise specified, subsequently washed with phosphate buffered saline (PBS) and lyzed in RLT Buffer (supplied with RNeasy® Kit). Total RNA was isolated from all samples as described in the manual provided with the RNeasy kit and stored at –80°C.

Fluorescent labeled aRNA (amplified RNA) constructs were obtained by *in vitro* reverse transcription of the RNA followed by an *in vitro* amplification reaction.

2 µg of isolated total RNA were used per sample to amplify RNA by applying only one cycle of in vitro transcription (IVT, Millenium Biologix AG, Application Note).

2 µg of total RNA from each sample was primed with oligo$(dT)_{24\text{-mer}}$ (containing a T7 RNA Polymerase Promotor) and reverse transcribed using 400 Units SuperScript II reverse transcriptase enzyme, nucleotides, 5x Reaction Buffer and Dithiothreithol (DTT) as described in protocol provided with the enzyme. For ribonuclease protection 1 µL RNase inhibitor (10 Units) was used to prevent RNA degradation during first strand synthesis. This first strand synthesis reaction was incubated for 1 hour at 42°C.

To the first strand synthesis reaction 93 µl nuclease free water, 30 µl second strand buffer (Invitrogen, Basel, Switzerland) and 1.5 µl nuclotide mix (dATP, dTTP, dGTP, dCTP, 25 mM each) was added.

Second strand synthesis reaction mix was obtained by adding 40 Units E. coli polymerase I (New England Biolabs, BioConcept, Allschwil, Switzerland), 10 Units E. coli DNA Ligase (New England Biolabs, BioConcept, Allschwil, Switzerland) and 2.5 Units Ribonuclease H (Fermentas, Labforce AG, Nunningen, Switzerland). Reaction was incubated for 2 hours at 16°C.

After this incubation step remaining RNA was degraded by adding 7.5 µl 1M sodium hydroxid containing 2mM EDTA (Ethylenediaminetetraacetic acid) for 10 minutes at 65°C. 7.5 µl 1M Hydrochloric acid was added to neutralize the reaction.

The obtained double strand DNA was purified in a QIAquick® PCR purification kit (Qiagen, Hilden, Germany) and concentrated to 7.5 µl. To this concentrated RNA following reagents were added to obtain aRNA synthesis mix: 2 µl ATP (Adenosine triphosphate, 75mM), 2 µl GTP (Cytidin triphosphate, 75mM), 2 µl GTP (Guanosin triphosphate, 75mM), 2 µl UTP (Uridin triphosphate, 75mM), 1.5 µl 5-(3-aminoallyl)-Uridin triphosphate and 2 µl reaction buffer and 2 µl Enzyme mix (both provided with Ambion MegaScript Kit, Ambion, Cambridgeshire, United Kingdom).

This aRNA synthesis mix was incubated for 4 hours at 37°C. Remaining double strand DNA was digested by adding 1 µl Dnase I for 15 min at 37°C. aRNA was cleaned and concentrated with an RNeasy® Mini Kit column (Qiagen, Hilden Germany) and then concentrated to a final volume of 9 µl.

Fluorescent dye molecules were coupled to the reactive aminoallyl groups of the incorporated a 5-(3-aminoallyl)-Uridin triphosphate molecules. One aliquot of either Cy3™- or Cy5™-mono reactive dye (Amersham Biosciences, Buckinghamshire, United Kingdom) was diluted in 40 µl water free Dimethyl sulfonoxide. 10 µl of one of the diluted Cy™ mono reactive dyes was added to each sample buffered in 100mM Carbonate

buffer (pH 9.00). Reaction was quenched after 1 hour by adding 10.4 µl Ethanol amine for 15 min at room temperature.

Unincorporated dye molecules were removed by ethanol precipitation. 2 µl Glycogen (Invitrogen, Basel, Switzerland) was added as carrier during precipitation. After precipitation aRNA pellet was washed with 80% ethanol, dried and resuspended in 50 µl 1x Fragmentation buffer (200mM Tris(hydroxymethyl)aminomethane hydrochloride, 500 mM Potassium acetate, 150mM Magnesium acetate). aRNA was fragmented for 35 min at 94°C and placed on ice immediately. Fragmented aRNA was dissolved in 900 µl hybridization buffer.

For denaturation aRNA was incubated for 5 min at 98°C and centrifuged for 30 sec at full speed in a microcentrifuge.

One CART-CHIP™ 300 (Millenium Biologix AG, Switzerland) was placed face down in a standard hybridization chamber. Hybridization solution containing the denatured and labeled aRNA sample was injected using a standard micropipet whereas Cy3™ and Cy5™ samples were hybridized together in one hybridization chamber (Millenium Biologix AG, Switzerland). The microarrays were incubated overnight at 42°C in a PCR thermal cycler (TGradient, Whatman Biometra GmbH, Göttingen, Germany).

After incubation unspecific aRNA probe was washed away with 1xSSC, 0.1%SDS for 5 min at room temperature, followd by another wash step in 1x SSC, 0.1% SDS for 5 min and rinsed with 1xSSC without SDS for 1 minute to remove excessive SDS. 1xSSC was discarded. Remaining 1xSSC buffer on the slide surface was removed by centrifuge the slide for 2 min at 1500 x g.

The dried CART-CHIP™ 300 were then scanned using an Affymetrix 418 microarray scanner.

Expression level raw data for every spot was obtained with ImageQuaNT (Molecular Dynamics). Raw data was normalized by dividing every expression value by total expression value of all spots for every sample and filtered by setting all values below the 25 percentile to the value of this 25 percentile to remove noise (25 percentile threshold).

For each sample (e.g. de-differentiated and re-differentiated chondorcytes) a list of all measured genes was generated. This so called gene expression profile was then used for subsequent analyses.

Further data analysis was performed using either hierarchical clustering with cluster.exe (written by Michael Eisen, Stanford University) or Self Organizing Maps (SOM), such as GeneCluster developed by Whitehead Institute (Massachusetts Institute of Technology, MIT). The settings of the software were optimized until a reasonable number of clusters resulted that were able to represent the comparison thoroughly. In the following example the parameters were as following:

Basic parameters: SOM rows 6; SOM col:4; #epochs=3000; #seeds=1

Advanced parameters: initialization: random vectors; neighborhood: bubble; alpha I=2; alpha f=0.005; sigma I=3000; sigma f=2.

Fig 1 shows a typical result from a SOM analysis with the above mentioned basic parameters, whereas Fig 2 shows an example of a graphical presentation of a cluster analysis and viewed by the software treeview.

Example 2: Quality Control and Human Cartilage Sample Classification

Useful to demonstrate how CART-CHIP™ 300 can be used to differentiate between diverse cell culture conditions, to distinguish different patients, to study the influence of 3D culture conditions and to serve as a quality control tool during any tissue engineering process.

Human chondrocytes isolated from 4 different donors were proliferated over one passage (P1) and then cultivated as high density pellets ($0.5*10^6$ cells) in 3D culture for 7 and 14 days. RNA samples were taken from proliferated as well as from 3D cultured cells resulting in totally 12 different samples as shown in Figure 8. RNA isolated from this samples was shreddered in a QIAshredder (QIAGEN, Hilden, Germany), amplified, hybridized, washed and scanned as described in Example 1.

Data sets for all 12 samples were extracted and normalized as described in Example 1 to perform cluster and SOM analysis as noted below. Cluster analysis was performed using normalized data computed with GeneCluster.

Fig 3 shows a picture of such a cluster analysis for all 12 samples (#1-#12) consisting of 20 clusters (c0-c19)

Every cluster represents a typical gene expression pattern for all 12 samples indicated by a point, starting from sample #1 on the left hand side to sample #12 on the right hand side in every cluster. For example cluster c0 represents the expression level of 104 genes in all 12 samples in a given range indicated by the lines located above and below the computed points.

Another example for gene expression levels that behave similar for different culture conditions and donors are depicted in clusters c3, c4, c9 and c10. Meaning that every subset of the three donor specific points #1-#3, #4-#6, #7-#9, #10-#12 (see Tab V for detailed description) have gene clusters that behave similar in all analyzed samples.

An example of differently behaving genes is indicated in cluster c13, representing 10 genes that behave similar in donor #1 and #2 but show a different gene expression patterns for donors #3 and #4.

More detailed analyses are shown in Fig 4, Fig 5, and Fig 6. The clusters produced in these figures clearly demonstrate differences as well as similarities in cell behavior for either t0, t7 or t14 days, respectively.

Another software algorithm that can be applied for analysis of large amounts of data coming from gene microarrays is called hierarchical cluster analysis, whereas genes and/or different conditions with similar behavior in gene expression are clustered together. All hierarchical cluster analyses were performed using Cluster software described in Eisen et al. (1998) PNAS 95:14863) and displayed using treeview.exe developed by same author.

Fig 7 shows such a cluster of selected genes for all 12 samples analyzed. Every square is representing one single gene

expression value. Different intensity means different expression levels. Dark squares are representing samples without any significant change in gene expression compare to the other samples or patients. Bright squares are indicating samples in which genes are up- or down-regulated relative to other samples analyzed. A so called cluster of genes is a group of genes that behave similar from one donor to the other donors.

Not only genes but also samples can be clustered together. These clusters are called similarity dendrograms, shown in the top part of Fig 7. These tree-like structures illustrates similarities in gene expression between different samples or donors. The closer a sample (#1...#12) is located to another sample in this dendrogram the more similar gene pattern they have.

Interestingly to see is that the seven samples located at the right side of the dendrogram (samples #1, #2, #5, #7, #8, #10 and #11) are clustered together. This samples are representing t0 and t7 conditions as described above (illustrated in Tab V), whereas a cluster of 4 samples in the middle of the dendrogram (samples #3, #6, #9 and #12) are representing only t14 samples. This means a microarray of the current invention is able to distinguish between de-differentiated, proliferated samples (t0 and t7) and re-differentiated samples in a later stage (t14).

An outlier represents sample #4 located at the most left side of Fig 7. which represents proliferated chondrocytes (t0) from donor 2 and could not clustered together with the remaining proliferated samples. Interestingly, this sample that it is not similar to all other proliferated samples (#1, #7 and #10) was impaired with its capacity to form cartilage tissue equivalents following expandation in 2D culture. The biochemical analysis revealed a lower amount of total collagen/DNA for this sample and immunohistochemisty with collagen II antibodies resulted in only weak staining for a collagen II.

Example 3: Aortic Fibroblasts vs. Chondrocytes

Example to differentiate between expanded chondrocytes and aortic fibroblasts cultivated over 14 days in 3D settings.

A human aortic fibroblast cell source was proliferated and brought to 3D culture. RNA was isolated after 14 days of culture. Expression data analysis was performed as described in previous Examples 1 and 2 using CART-CHIP™ 300 microarray.

A hierarchical cluster analysis was performed as described in example 2. Samples representing 3D culture after 14 days (t14) were included in said data analysis (samples #3, # 6, # 9 and #12, see Tab V).

The result of the described analysis can be seen in Fig 8. The upper part of the figure shows a dendrogram as described in example 2. Aortic fibroblasts are not clustered together with human chondrocytes. The cluster shows a significantly different pattern compared to all other cultures.

Obviously a gene expression pattern of an aortic fibroblast cell source can be clearly separated from a gene expression pattern of human chondrocytes. A micorarray of the present invention is therefore not only able to study differences between different chondrocyte culture conditions but also to distinguish between cells isolated from different tissues.

Example 4: Arthritic conditions vs. healthy conditions

Useful to distinguish between normal healthy chondrocyte behavior from cells resembling an arthritic phenotype. Interleukin-1β is known to play a central role in the inflammation and connective tissue destruction observed in both rheumatoid arthritis (RA) and osteoarthitis (OA). Stimulation of *in vitro* chondrocyte cultures with Interleukin-1β thus represents a simple experimental arthritis model.

The chondrocyte cell source from donor 4 (see Tab V) was proliferated over 3 passages and then cultivated as high-density pellet cultures ($0.5*10^6$ cells) for 16 hours and 7 days either in the absence or presence of Interleukin-1β (30 ng/mL). RNA was isolated from all samples,

hybridized to CART-CHIP™ 300 and expression profiles were generated as described in Example 1.

A hierarchical cluster analysis was performed as described in Example 1 and the dendrogram and a selection of the representative gene clusters are shown in Fig 9. This clearly shows that already a short stimulus of Interleukin-1β results in alteration of the chondrocyte phenotype with gene expression changes that can be distinguished from untreated normal chondrocyte cultures.

Appendix

Table I

Experiment and correlated gene expression analysis	Number of marker genes for each experiment (analysis)	experiment (analysis)
2D marker adult vs. fetal/infant	151	A
2D /3D adult vs. fetal/infant	96	B
3D marker failure	165	C
3D marker adult/fetal/infant	350	D
2D/3D marker adult	48	E
Time dependent failure marker	75	F
3D failure marker	41	G
Apoptosis related failure markers	30	H

Table V

Sample Numbers (#)			
	Proliferation (t0)	**7 days in 3D culture (t7)**	**14 days in 3D culture (t14)**
Donor 1	**#1**	**#2**	**#3**
Donor 2	**#4**	**#5**	**#6**
Donor 3	**#7**	**#8**	**#9**
Donor 4	**#10**	**#11**	**#12**

Table IV shows the results of a bioinformatic analysis of gene expression profiles of the 467 cartilage specific marker genes.

Accesion	Cluster	SOM Description	H4 P2 3D	failure pool	H5 P1 2D	H4 P2 2D	H4 P1 2D	H5 P1 3D	H1 V2 l0	H1 V2 l2d	H1 V2 l4d	H2 P1 3D	H2 P1 2D	H3 F P4 l0d	H3 F P4 l2d	H3 F P4 l7d
AA283693	2	2D/3D	0.620146952	0.663012608	0.543651567	0.487462855	0.502962907	0.971864748	3.60E-02	7.00E-02	0.322363183	0.447391374	0.257739798	0.143513725	0.213829818	5.224212686
AA845156	2	2D/3D	1.822887384	1.974062517	1.793508407	2.056234156	2.134502741	2.109819189	1.28342518	1.663140939	1.384248409	1.041642418	1.859400083	1.332668422	1.018759389	5.129921131
R52548	22	2D/3D	42.15305285	24.91632836	36.03204148	38.20234471	38.12886555	36.73272848	24.22599845	23.2864338	18.34158303	25.57074708	22.01795031	27.50011776	26.82422658	0.455258887
T67128	4	2D/3D	0.114907897	0.165223543	0.175143838	0.230515232	0.111518632	0.115949318	0.104460037	3.43E-02	1.158151225	0.122945522	0.194757907	0.263409159	0.266372201	15.92056233
AA845015	8	2D/3D	5.152985898	5.163366388	4.600617698	5.490400618	5.613170246	5.081143315	5.971265034	6.593146942	3.845471328	4.218022136	6.266907187	4.459497525	3.113814791	23.77610407
AA937895	8	2D/3D	2.841572293	2.035680155	2.574530008	3.532376413	2.904240444	2.68987266	0.452860231	0.364695951	1.498136505	1.34894881	1.524476699	1.004544129	0.332881119	23.03713043
AA844998	15	2D/3D	9.597114182	13.63928436	14.05976269	12.99542024	10.56590581	11.73420854	11.26686885	9.619376872	4.163473688	8.673344954	10.804701	11.6741356	8.48774821	0.687222456
AA844818	16	2D/3D	34.95251239	32.56836092	35.29512048	39.31305252	38.10953207	32.97879549	48.83476799	54.52879325	40.56584843	54.89200718	49.39056409	42.93573187	47.44855774	6.960856259
AA894557	16	2D/3D	56.23673424	43.61031652	39.30704958	58.47875881	59.70042823	48.33981986	49.93864852	44.42230199	49.4951755	65.92881949	60.33602871	39.11417155	46.47247102	1.451946866
AA872001	20	2D/3D	81.81389212	58.44454367	39.30704958	89.11888026	82.12028621	54.71499842	54.20005466	64.75076884	65.42329815	62.45668946	67.24659793	53.73423923	63.31563058	1.313345062
H09590	1	2D/3D	0.538758103	0.606029834	0.923090371	0.810970303	0.582446119	0.488788664	0.653737608	0.390597399	1.521400852	0.559410558	0.287251416	0.132045049	5.76E-02	9.888630279
AA868278	11	2D/3D failure vs. cartilage	0.872435407	1.541743461	1.320841165	1.418331235	1.44054309	1.142574932	4.209025695	6.432026011	1.564621878	2.03670347	3.658833325	5.697415556	5.585056007	4.869119818
AA490855	11	2D/3D failure vs. cartilage	5.256355042	3.982907846	3.740473099	5.019900855	5.072810576	4.193769533	7.139496238	7.480509788	2.402406359	2.11287388	3.291155604	4.163992221	4.626992228	4.040992653
H05820	2	2D/3D failure vs. cartilage	0.326771454	0.298568027	0.723972051	0.373421152	0.291228161	0.42426813	0.250153138	0.2218924	0.884601448	0.443767203	0.853117504	0.577197042	0.227069034	8.569006814
N57766	3	2D/3D failure vs. cartilage	1.244580879	1.430645893	1.237128762	1.435760892	1.621084111	1.793426963	0.161049609	1.029762957	0.860155011	1.160409378	0.696379763	1.945055757	1.505490705	18.21899443
AA873895	3	2D/3D failure vs. cartilage	2.389977721	1.402865274	1.960300849	2.642126183	1.174416144	2.132327997	0.576137629	0.747123688	1.384947624	0.484042151	0.351548888	2.300286033	1.66211811	31.75585388
AA878880	3	2D/3D failure vs. cartilage	1.975516413	0.706271534	2.235200516	2.852909562	2.341957598	2.325462095	0.214554685	0.751859199	1.555155015	0.580037834	0.413262131	0.487069801	0.493477276	17.65353573
R54818	6	2D/3D failure vs. cartilage	1.433222617	1.408764041	1.026467036	1.653245959	1.555280568	1.313068482	0.546965459	0.409947934	0.199952191	0.325728665	0.57824012	0.478785614	0.149018732	5.693624857
AA459030	23	2D/3D failure vs. cartilage	6.225911846	7.131102889	6.449691069	7.191223742	7.435526281	6.273231774	10.09192142	11.58519602	4.33841323	6.048695083	5.824480196	13.79679436	10.66742278	10.18586889
W37864	11	2D/3D failure vs. cartilage	3.42542852	3.434948923	2.822843216	3.920408386	4.031440051	2.924316539	2.917746890	4.089689479	1.262910319	1.511275797	1.980865808	5.197874299	6.453757844	5.811360752
N63192	11	2D/3D failure vs. cartilage	2.016416698	1.880341617	1.955128465	2.604284112	2.555988174	1.868963757	3.165162737	4.106218227	1.558423149	1.5903632	2.110133253	5.489587577	6.303860434	5.163746281
R55789	11	2D/3D failure vs. cartilage	3.050734207	2.916359387	2.459270264	3.086180697	2.768681843	2.87080332	5.839714648	7.877144785	2.229165523	3.701220707	3.164509514	3.916307321	3.178401276	3.905915697
R56971	14	2D/3D failure vs. cartilage	8.05304356	6.763218112	9.202602512	9.315742803	9.656817425	6.703182113	6.541201261	9.565581925	5.095436247	5.327868943	7.13885299	8.798222752	9.999533942	1.720941975
AA448659	15	2D/3D failure vs. cartilage	4.086696472	7.404785733	3.70432959	4.624265035	4.780951669	5.12097414	6.40985601	8.062945347	2.837008591	2.740282482	3.524896196	8.26544815	9.131700385	6.724601997
AA235388	11	2D/3D failure vs. cartilage	4.793907209	5.590616298	6.430749719	6.119408498	5.787215762	5.448903875	5.495213871	7.128779744	1.810297945	3.365604514	4.797167927	5.188848193	3.719920825	3.55603538
W37769	18	2D/3D failure (adult)	9.668163573	9.041797201	10.48060069	9.18235887	9.778057041	9.301866835	7.944164954	9.806778833	2.976028459	4.717147657	6.792587093	10.44168598	10.63208914	8.961263558
AA421701	18	2D/3D failure (adult)	8.39951543	8.944977864	6.787000717	7.805796465	8.044148563	6.091762141	8.998110252	11.20923244	3.344552795	4.634853853	5.630305124	9.009982779	7.214242967	6.678253864
N81029	22	2D/3D failure (adult)	11.25612668	7.636201295	9.791822816	10.26909779	11.09189889	11.24056884	12.53804212	11.46996906	3.601513562	9.079241362	7.051304119	8.667406893	7.10394857	6.694763747
AA644128	22	2D/3D failure (adult)	8.87008766	8.634238681	8.980680688	10.62210945	11.07634365	8.151499526	11.11148757	10.68939875	3.391349693	5.57092524	5.21033759	8.326957952	9.601034583	6.395745244
N26536	23	2D/3D failure (adult)	1.127588919	0.934050212	1.276862277	1.339090617	1.722882887	1.543709239	12.17742976	9.963934008	2.083996724	2.539684871	3.336342818	6.091759705	5.481627936	4.663694736
AA890663	23	2D/3D failure (adult)	7.502466565	6.586516448	6.707110583	7.582524442	6.272458865	6.92700675	13.06099681	8.389833107	0.735877843	3.645361923	5.830896283	10.14275452	7.73405205	6.622524146
AA405987	17	2D/3D failure (adult)	8.007849934	7.398131991	7.180024565	9.644484085	9.329435489	7.017060375	10.80261435	12.021725	2.747874952	3.870971862	6.423478204	9.717748938	10.38278845	8.452850767
AA868102	4	2D/3D failure (adult)	1.159709394	0.997393508	1.761866087	1.609558388	3.076463138	1.894862168	1.015717155	1.005037798	10.31208553	1.090891115	0.620362547	0.742540888	0.217171056	0.963761651
H09730	23	2D/3D failure (adult)	5.016598581	4.36097919	4.512218769	5.75487459	5.709409309	4.568792922	11.63478455	9.263731897	3.698744789	6.251076878	11.24128172	10.27180594	6.218265778
AA285155	22	2D/3D failure (adult)	3.911163963	4.375731694	4.103404998	3.976701687	3.566916248	4.846020855	12.85800077	9.831583278	3.688749895	5.365619531	5.184975167	7.402395089	7.379800537	6.209684883
AA873351	1	2D/3D failure (adult)	0.715716774	0.448961688	1.143094939	1.086305702	0.6843681	0.576661574	0.470607591	0.631814307	7.979362808	0.79873277	0.500676851	0.326537695	0.408343693	0.899376594
H12320	1	2D/3D failure (adult)	0.561973556	2.57723008	0.516528255	0.964969035	0.426769958	1.536698149	0.282438829	1.169093316	7.275998896	1.197729988	0.103345305	0.205188914	0.219791049	0.757004021
AA856556	1	2D/3D failure (adult)	2.083875002	0.734906889	0.98056715	1.17363108	0.340692819	1.146139751	0.397739466	0.400975764	8.510141689	1.29264139	0.857904175	0.471468936	0.271477848	0.790926029
R43581	2	2D/3D failure (adult)	2.106534421	0.601495831	2.998509555	1.885349164	1.78560062	1.913887067	0.381477112	0.761735816	6.064087362	1.931094763	0.818248288	0.397440561	0.456001183	0.419248288
AA633768	2	2D/3D failure (adult)	0.641660349	0.394897957	0.989161585	0.80349418	0.676931908	0.471526265	0.760761379	0.497766033	5.606806853	0.639670185	0.393352577	0.951794529	0.601192692	1.144875198
AA496880	2	2D/3D failure (adult)	0.819001028	0.446244605	1.078973936	0.96946743	1.001567705	0.612915544	0.493894518	0.572564726	6.056796145	0.653312475	0.514470842	0.502539979	0.501308175	1.212402498
AA626632	4	2D/3D failure (adult)	1.493144759	0.535855307	2.320048835	2.145585116	1.461514048	1.208574247	0.842550697	0.950281232	10.68497135	1.681720166	0.695569959	0.498447008	0.274396994	1.69499
R40850	3	2D/3D failure (adult)	0.682308084	0.595008017	1.326681758	1.169113039	0.576813769	0.894548353	0.394670084	0.383742341	4.987702878	1.362523305	0.380406218	0.141276114	0.169003657	0.619590629
AA486072	9	2D/3D failure (adult)	2.033091331	6.009395549	1.397241773	1.306335917	1.667598388	4.321686833	1.063850678	3.668838298	12.43527006	3.538640747	0.712197565	1.714315274	1.299858757	2.072066795
H80129	4	2D/3D failure (adult)	0.351536161	0.860381999	1.012366932	0.336466005	0.442915198	0.530986468	0.10312387	0.42006458	10.27394074	0.364964803	0.173871475	3.53E-02	9.69E-02	1.445787697
T67270	5	2D/3D failure (adult)	1.983529883	1.201108371	3.314347202	3.108011309	2.159811403	1.603756559	0.706906482	1.1288523	9.031533244	1.747487433	1.676363321	0.971529338	1.02792629	1.159935914
AA776364	6	2D/3D failure (adult)	0.962462885	0.468437574	1.000125084	1.050963409	0.840547206	0.712318096	1.05308668	1.608943684	7.115065643	1.060601139	1.428674622	1.215371395	1.028193827	2.050690416
AA464743	6	2D/3D failure (adult)	1.419135024	0.972417085	1.72467226	1.536612587	1.441826888	1.267977482	0.720584255	1.207641114	6.709848146	1.123344154	0.916034948	0.548390408	0.6724641	1.948529432
AA663983	7	2D/3D failure (adult)	0.992237246	0.562108496	2.11407474	1.505736573	1.504937007	1.383339821	2.040575612	0.913188369	5.16313531	1.007867654	1.323649464	2.135989003	8.32E-02	3.811870002

AA634008	8	2D/3D failure (adult)	1.633316095	0.546444823	1.670199139	2.668127971	1.579545189	1.258079751	1.359339921	1.036497507	13.34177496	1.724576212	0.653238694	1.024786523	1.060524094	1.956193928
AA683050	8	2D/3D failure (adult)	1.604349305	0.509305823	2.869733356	2.49429974	1.663928936	1.276592262	1.013489887	1.038528355	15.81952721	1.58843476	0.496740614	0.558453728	0.815020852	1.666191062
AA775674	3	2D/3D failure (adult)	1.787634448	0.639410548	1.3560157	1.263003994	1.234797131	2.355564777	0.246852476	0.424585862	5.143824512	0.974500161	0.529437509	0.290250898	0.38554521	1.21495112
AA029934	19	2D/3D failure (adult)	2.356636943	1.558846586	2.787420472	2.743130089	2.330296295	2.141155369	10.39281667	6.173829216	3.256015168	2.937213126	3.76308931	6.718135076	4.994432581	4.353783816
AA872397	21	3D adult vs. fetal	19.50233662	17.51369555	30.1499536	23.26630505	24.52945535	17.84127943	46.00745139	39.17088563	36.04470776	60.24320179	47.48372041	40.84667624	48.51971658	25.61671577
AA428195	3	3D adult vs. fetal	7.071920614	5.267987663	6.138557001	7.23507727	7.48271081	5.35099209	5.50376757	5.85445104	2.298660486	2.154530299	3.416182085	4.515305124	4.564261077	3.09255509
AA478724	3	3D adult vs. fetal	5.246364716	3.470387154	4.172040349	5.052705318	5.168529149	6.015264941	2.441015531	4.011719078	1.703691212	1.339633814	2.575865932	1.573760187	1.247433101	2.275922402
T40541	2	3D adult vs. fetal	3.238989946	12.31479553	2.521870024	1.464626573	2.463205882	6.610009772	0.275153908	0.545092967	3.902616974	0.963575817	9.51E-02	8.50E-02	3.92E-02	1.06319634
N33214	2	3D adult vs. fetal	2.65473448	2.961197481	1.727113813	1.517196864	1.863643598	5.009412046	0.13076449	0.257442727	1.248745094	1.214458176	0.147732522	0.479395409	5.23E-02	1.778833698
W69399	2	3D adult vs. fetal	2.836334543	2.418647835	2.384859773	1.271557096	2.218662035	4.984390107	0.345223646	0.364082141	1.11200994	0.651631362	0.156264888	4.35E-02	5.26E-02	1.090858575
H85454	2	3D adult vs. fetal	2.580698668	1.88582991	1.388508005	1.244844015	1.534483051	3.983108173	0.177423187	0.164239157	0.25952362	0.278813509	0.207716277	0.192426939	0.293284362	0.980664216
T71284	2	3D adult vs. fetal	1.966878018	2.475258573	0.744163047	0.768307025	0.765085426	4.427870608	3.25E-02	4.43E-02	4.34E-03	0.114965169	0.174872171	0.141660059	0.315197363	0.637643567
N95418	2	3D adult vs. fetal	3.21585913	1.583715156	1.572090076	1.152454683	1.55045145	4.188669886	7.17E-02	4.66E-02	0.17695605	0.230927882	2.96E-02	3.19E-02	1.92E-02	0.409050076
AA430675	18	3D adult vs. fetal	20.40011187	13.5115773	23.35924913	19.03556124	22.70504494	16.6788312	29.9586379	29.49810318	30.86231132	32.28482203	44.49536923	33.27001036	32.81546787	20.72524354
AA682851	21	3D adult vs. fetal	25.44236224	17.10952218	33.76684841	28.22129217	28.86052023	24.00871315	46.90243645	42.6704861	49.46272263	54.93185512	60.11034283	37.00532862	37.62408168	23.34221611
AA427433	3	3D adult vs. fetal	6.682930727	4.737477088	5.985736157	7.06879228	7.217223212	6.130314027	4.590770914	6.491096293	2.119161449	2.512849593	3.622778825	5.405043355	5.599238453	5.427644127
AA100295	21	3D adult vs. fetal	18.73518464	14.16222538	25.17519653	21.63898477	21.16013508	17.85039728	39.44423676	56.23942898	41.49374024	50.80500421	43.55754452	57.54473062	53.89058071	27.20955224
AA070997	20	3D adult vs. fetal	21.13329064	16.5080222	30.63655114	26.1438582	26.27182686	19.46457951	44.50541019	42.47813824	34.76574485	44.39487164	50.26187697	33.36357052	29.205598	27.82261502
R27585	20	3D adult vs. fetal	18.95998765	13.51396253	26.82697423	21.45047839	21.44832833	16.96978325	35.33261309	33.39411146	29.7220802	41.54702124	41.6509187	34.23348926	28.42844313	25.01470127
N71628	20	3D adult vs. fetal	18.60838994	16.33393606	26.69120529	21.6113028	21.33877846	16.98487299	29.62587768	25.73280775	27.314568		42.44286692	32.44686223	28.50781759	31.40872062	17.11695398
AA464568	20	3D adult vs. fetal	16.06992797	10.85633998	18.70563179	17.27026289	17.70073984	14.07448353	38.70082765	34.8718368			38.3694724	32.25023113	37.7985424	38.44938631	22.42777135
AA043228	20	3D adult vs. fetal	12.81312824	9.803849829	17.97620829	14.19332756	14.28559054	10.85546077	35.07501988	35.26663595	39.99311042	38.42578454	28.84881089	33.09819082	42.01213318	20.20000016
AA478273	19	3D adult vs. fetal	52.06928197	32.17017287	36.30704958	47.93432102	43.94005516	45.65265571	24.39470164	24.77474479	23.18365645	21.68455412	23.61056895	34.11709903	37.1720164	22.29749728
H05619	2	3D adult vs. fetal	2.632906988	4.642300383	1.284880525	0.973906438	1.926880261	4.570583898	0.287634172	0.126355776	0.103328665	0.53496355	0.113769783	0.103142991	0.103572238	0.411960124
AA405562	6	3D adult vs. fetal	6.993441389	4.782974749	5.219581264	6.611943238	6.447811984	5.853372531	13.78665714	15.04195781	4.06566807	10.07318468	10.12150087	9.869201864	10.11316283	9.063379829
AA147043	5	3D adult vs. fetal	5.26712978	4.856265473	6.499381882	5.561464269	5.30607401	5.35955551	10.08577793	10.38848924	8.480460276	9.593900583	10.3223246	9.358593384	9.251590954	7.969342929
AA035384	5	3D adult vs. fetal	6.401728539	4.12666021	7.578771481	6.904866564	7.128981272	5.672655498	12.04070004	12.92252006	15.89036327	11.03937435	13.98924616	10.56026075	7.850369977	8.464122084
R60150	5	3D adult vs. fetal	4.215197474	4.38442636	4.860194784	4.973592031	5.301613877	4.146462455	9.833059103	11.34413022	3.55905762	6.14546369	6.554543073	8.219606808	10.11852936	7.877309384
N64051	5	3D adult vs. fetal	5.426681638	4.928079432	5.608870527	5.622962025	5.371210998	4.561721051	20.20297	17.93454359	6.059875542	10.65425592	11.69250488	14.02690246	13.40703529	11.39979162
AA405746	5	3D adult vs. fetal	5.368605864	3.19002151	4.353339928	4.106442793	5.477050316	4.525368392	11.19414229	11.22331463	8.725898139	10.22004433	9.938101581	9.624639345	6.736761694	7.207953341
AA481110	5	3D adult vs. fetal	3.575328316	2.604624915	4.130714878	3.915938643	4.131312688	3.482794563	11.42516439	11.54464774	11.22768955	11.5865327	9.335135487	1.599312321	1.604370138	0.742502214
AA845167	5	3D adult vs. fetal	3.76578459	3.609211434	4.618092536	4.244750176	4.779380405	3.825719327	15.24112672	15.33748563	10.34294903	10.49210116	9.895195623	11.54052429	13.14844812	9.845307435
AA443118	5	3D adult vs. fetal	4.314381512	6.09876062	6.276759492	5.303887624	5.568446187	5.169715811	15.71033269	12.21523831	7.068371438	9.278769927	12.62454607	12.73679044	11.99501447	11.26365022
N92319	3	3D adult vs. fetal	4.572213322	3.033513374	3.954505947	3.067302105	3.243795499	6.319683552	0.68013854	0.462694318	0.441158367	0.601101086	0.511427071	0.785109566	0.113909879	1.02841734
AA187148	5	3D adult vs. fetal	5.511820527	5.984833947	8.561456451	7.536771775	7.330918349	4.996228711	11.23551547	10.38626391	7.898742343	8.98515106	8.886781354	9.776711668	9.067245371	5.447187287
AA253413	3	3D adult vs. fetal	5.753953945	4.708057923	5.13409191	6.221909098	6.216223439	4.722726068	5.375893098	6.14287559	2.014829497	2.303548324	3.272998057	3.697482133	3.356931434	3.421688731
AA046701	4	3D adult vs. fetal	7.244740869	7.004200569	9.55974171	8.437552392	9.263082719	6.552005827	16.07206256	16.18438115	15.35025693	11.75303107	17.53371006	21.28041445	23.57251469	18.29553133
AA164562	4	3D adult vs. fetal	7.627425507	5.216496768	8.699986728	7.923881699	9.508233607	6.844029007	13.50181337	11.65115038	11.90157085	12.70121113	13.97404342	19.51320109	20.14729058	12.69772918
AA496357	4	3D adult vs. fetal	6.41575683	6.975113261	10.40229719	7.98745072	8.41742583	6.451127762	19.81244564	19.08483294	9.978745784	13.47424147	16.26843795	17.39386742	17.49834817	12.94888047
AA180742	4	3D adult vs. fetal	5.52121397	6.234552553	8.103930847	6.983187569	6.946239241	6.26480073	21.52699749	16.35007636	6.426135031	15.13185304	13.19450881	15.59400571	17.9357522	13.28038701
AA454743	4	3D adult vs. fetal	7.511488312	9.369158012	11.34696747	9.562551962	9.456937624	7.36978659	14.91925254	13.9599813	8.65144627	12.90834328	11.96847998	14.68622205	15.68194498	11.59505554
AA437226	4	3D adult vs. fetal	7.112744497	6.791853264	10.80511143	8.266289799	8.507470188	7.034847587	14.85387781	17.10133551	12.22946701	13.14384264	15.14400311	17.52701687	17.25793589	10.50190917
AA458849	3	3D adult vs. fetal	5.469328544	3.66373147	4.903306694	4.827076947	5.660206542	4.514629804	2.017166995	2.34556391	1.907000999	2.12162749	2.328337653	2.492378456	2.054641085	2.159670081
AA504891	3	3D adult vs. fetal	5.258178068	8.251213126	6.90322093	6.369912834	5.676523521	7.288981598	6.821939878	6.718804337	7.304547885	2.689809519	4.718893827	4.373418086	5.049991825	7.871176277
AA609655	18	3D adult vs. fetal	21.33429032	19.08081783	30.01089002	23.9982204	26.31681248	20.18144049	33.01277519	28.42862393	30.32802604	37.60777602	42.07314192	25.19427243	25.92346393	17.03793178
AA599158	5	3D adult vs. fetal	5.73905777	4.765585417	8.346245119	6.423634441	6.61080494	5.063695516	7.858588214	7.185543001	6.300783712	6.597531463	10.27562393	10.16458119	6.424601999	
AA052932	2	3D adult vs. fetal	4.160294487	2.163896002	2.752899749	2.096881401	2.192248117	5.413083915	0.253881413	0.171034437	0.786537559	1.088792528	0.303760633	0.25364904	0.134116019	0.728786605
AA789328	2	3D adult vs. fetal	3.49664111	3.795346147	3.543244396	3.202155462	1.664435653	4.690897198	0.343955354	0.254618771	0.598171232	0.419246635	0.43081793	0.595702083	0.354185573	1.725014554
AA129537	5	3D adult vs. fetal	5.490099148	4.033311964	6.753224678	5.270505052	6.104594281	4.671138177	8.960638915	7.77671287	8.311570259	11.4292329	11.96830695	14.65748429	13.25871143	8.624649205
AA486209	2	3D adult vs. fetal	2.951127838	2.622459107	2.396628552	1.876778497	2.154036569	4.999845899	0.130869696	4.19E-02	0.222978133	0.376314559	0.117276599	0.113920001	8.25E-02	0.77617085
H39018	2	3D adult vs. fetal	2.815824978	1.626966689	1.671944771	1.253970839	1.643279353	4.632663322	0.14027571	0.094249721	0.182618167	0.2492443	0.135370399	0.271580421	0.149412484	1.0709987
AA484217	2	3D adult vs. fetal	2.270265019	2.131831711	1.520659008	1.064619518	1.329400245	4.21418601	0.228422488	7.45E-02	1.63231874	0.357023921	0.235657222	0.260977316	5.92E-02	1.998287174
T95053	2	3D adult vs. fetal	2.688707692	5.33362498	1.794683232	1.531765242	1.715814755	5.3830072	0.506118797	0.705352124	2.701833003	0.643138309	0.324882792	0.304936811	0.263860115	1.188075083
AA454848	2	3D adult vs. fetal	2.102886248	1.537670373	1.346779699	1.127849141	1.214174754	4.183284488	0.220378821	0.171876877	0.622604377	0.509056108	7.62E-02	3.06E-02	4.12E-02	0.615361758

AA448400	2	3D adult vs. fetal	3.306242137	2.235006202	1.747624063	0.631226114	1.568082634	6.474436694	0.43389112	0.405349064	0.462918962	2.543019921	5.42E-02	7.67E-02	5.69E-02	0.744503106
H13691	19	3D adult vs. fetal	54.00052945	36.06027395	36.30704958	53.01474929	49.86794621	50.27373427	38.06839644	45.61749341	23.18204722	19.59908539	32.30677452	35.30376824	30.58992766	0.559437392
AA132086	2	3D adult vs. fetal	3.337097743	3.257550359	2.293125381	1.567514409	1.604751828	5.862999872	0.368363187	0.158208065	0.357001431	0.998742637	0.108277685	0.210123178	5.56E-02	1.097353089
AA466073	2	3D adult vs. fetal	4.351033023	4.04194944	1.452692862	3.511334664	4.118866207	5.709773871	0.223040973	0.324590132	1.411227979	0.464995516	1.253746511	1.167155752	0.478968407	1.88302538
N40945	2	3D adult vs. fetal	3.447096842	2.154568097	2.501683281	2.52085183	2.297385171	4.762374759	0.262201912	0.237321497	0.257785251	0.258650997	0.597559834	0.252450904	0.120562307	1.019389108
R55705	2	3D adult vs. fetal	2.909308613	1.851341621	1.432668968	1.212749384	1.638105054	4.556458468	0.137145705	9.33E-02	0.38327564	0.365029393	8.79E-02	2.14E-02	1.16E-02	0.672340722
H50114	2	3D adult vs. fetal	3.301736569	1.908387922	1.705840938	1.407414465	1.781048566	4.589212608	0.149230356	0.114329742	0.542033448	0.613679831	5.55E-02	1.78E-02	1.81E-02	0.601295897
AA452841	2	3D adult vs. fetal	3.981943611	1.231373773	1.0248198	0.963983432	1.620834153	4.505595398	0.241515568	0.336987054	0.216412064	0.47285925	0.332567526	0.409688162	0.241219124	1.10120583
W73790	2	3D adult vs. fetal	3.914886537	1.713927735	1.679258731	1.508715372	2.253084609	4.790266687	0.234487599	0.215971925	0.741717434	0.468556893	0.327293291	8.49E-02	0.104656358	0.735173064
N30302	17	3D adult vs. fetal	16.236426	14.33825503	20.17733457	16.72882972	18.60385984	15.82011639	26.09274291	22.41827113	23.15567368	29.55256655	21.88167764	23.38219956	20.81894087	13.76515858
AA291556	2	3D adult vs. fetal	2.858389118	6.164431067	2.312941111	1.624968319	1.959001697	5.460005926	0.384633299	0.205779368	0.659149864	0.446933867	0.146800827	0.145065316	0.356436595	1.601652315
AA598510	2	3D adult vs. fetal	2.698323873	2.653383075	1.709197068	1.448745897	1.852274765	5.166038663	3.61E-02	2.40E-02	0.108970915	0.102809842	7.65E-02	5.60E-02	0.037519507	0.438123593
AA453787	2	3D adult vs. fetal	2.702589425	1.620596987	1.717335506	1.499079329	1.522615002	4.378038549	0.512016161	0.518525655	0.584688061	0.68944295	0.284454929	6.55E-02	5.59E-02	0.634550941
H05655	2	3D adult vs. fetal	3.107515398	2.521892845	1.311805573	1.314199879	1.633779252	6.087070828	0.163032728	7.17E-02	0.27016244	0.166433702	10.00E-02	3.94E-02	9.58E-02	0.498009645
AA419177	18	3D adult vs. fetal	23.89742362	15.45485589	25.88217585	24.47790114	28.20825412	20.47309058	38.78866172	38.69047817	43.9286988	43.64178939	51.77202168	45.8338345	51.06623927	33.61266646
AA456807	18	3D adult vs. fetal	22.02916221	16.65443357	25.45874485	22.43485375	25.67182927	16.88009347	33.10376447	30.86801173	26.67225549	34.5554514	37.93370032	30.31855172	39.9630798	23.50761944
AA293218	18	3D adult vs. fetal	19.78666624	15.40443015	27.23128953	22.13209523	21.07504567	18.14351405	26.4028529	35.80834178	26.15447974	33.64819217	31.7917979	29.84313354	28.41862616	17.3599263
W44660	17	3D adult vs. fetal	12.7340951	10.689877	18.07307043	13.69427187	15.92917097	12.73205002	25.75715266	24.52077453	4.553792207	28.21041688	20.01117112	28.71589625	29.44026693	18.26283028
AA629062	17	3D adult vs. fetal	14.59679193	11.53376895	17.21229223	15.59989608	16.64541758	14.01615062	34.76420835	33.86130994	30.29052693	26.75522669	33.11709939	36.29104725	43.93948571	27.19603411
AA447674	2	3D adult vs. fetal	2.534264127	2.150154393	1.427789252	1.000328271	1.423442229	4.137781882	0.180546405	0.126712928	0.229464734	0.259752602	0.109955437	8.90E-02	6.90E-02	0.339734269
T52484	2	3D adult vs. fetal	3.236398407	3.026511181	1.638920999	1.617002106	1.759710423	4.84920807	0.281612925	9.64E-02	0.826718721	0.565508854	0.485893021	0.432859528	0.081805942	0.992986281
AA496810	2	3D adult vs. fetal	2.803422463	1.595899735	1.728921379	1.455020012	1.72732132	4.877833042	9.34E-02	7.12E-02	6.46E-04	0.295018299	8.08E-02	2.97E-02	2.19E-02	0.446821097
AA486233	2	3D adult vs. fetal	1.105294528	3.612629566	2.016514163	1.407057353	1.146012765	4.325105426	0.340410827	0.117869448	1.53377804	0.356012024	0.539022414	0.203021316	0.156983718	1.084397595
AA079775	2	3D adult vs. fetal	3.60412957	2.70567137	3.009055265	2.126182566	2.517322618	5.903186938	0.439060283	0.619002395	0.9808177	1.409206936	0.296042275	0.11668949	0.105478767	0.789070453
W73889	2	3D adult vs. fetal	3.174704174	4.228312305	3.583500944	3.632704149	3.233152734	6.073296967	0.126123783	0.64173358	2.015296373	0.918137122	2.418583185	8.49E-02	0.815254724	2.695275623
R50337	2	3D adult vs. fetal	2.262369181	1.301117771	1.696068083	1.246881305	1.59150746	3.84378734	2.97E-02	2.35E-02	0.295641965	0.133290557	2.04E-02	-3.11E-05	1.07E-02	0.398363748
R55018	2	3D adult vs. fetal	4.604058001	3.914420759	4.479334598	5.310431247	5.155223566	4.292901695	3.121779976	9.583304812	1.420346967	1.371280523	2.205699254	3.267553012	3.02014176	3.938693805
R46921	2	3D adult vs. fetal	4.481781503	3.60517107	3.194315863	3.736730328	4.059831528	3.62874894	2.400280379	2.776568441	1.281366833	1.119135092	2.939835087	4.354026018	3.384328112	4.379816557
R87763	2	3D adult vs. fetal	4.349371289	1.738958085	2.016576353	1.584246255	2.167157105	4.929744779	0.132976244	0.106549764	0.245268993	1.030976231	8.11E-02	0.130698981	5.81E-02	1.214742461
H69583	2	3D adult vs. fetal	3.472010106	3.169123065	3.070758833	1.876335035	2.529708287	5.629732134	0.18904047	0.101052954	0.236746017	0.351564341	9.66E-02	0.145392235	3.87E-02	0.781599712
R56046	2	3D adult vs. fetal	2.875034039	12.02198937	3.636042926	3.134295566	2.862500876	5.557443535	2.765909659	2.969666922	10.5096934	1.628253524	1.779842426	1.69343824	1.550682609	3.471096224
AA922705	2	3D adult vs. fetal	2.467900912	5.763848698	2.364224943	1.826235564	1.990935084	5.56199203	0.161006175	0.118245397		0.426100265	0.119115471	3.86E-02	0.02671598	1.293134938
AA497571	2	3D adult vs. fetal	2.392095741	2.030046874	1.8982167	1.167380172	1.445241279	3.891969777	0.135236965	0.118211417	0.99308562	0.328940183	8.72E-02	2.81E-02	3.65E-02	0.965119113
AA402440	2	3D adult vs. fetal	3.04018443	4.537674439	2.816687278	2.313436127	2.567871927	6.461198799	0.406400795	0.454152321	1.143777395	0.734135081	0.607411285	0.139247414	9.06E-02	1.2521297
H29521	2	3D adult vs. fetal	3.458079561	2.089088468	1.722877256	1.458446529	1.929968192	5.381928045	0.292621042	0.214822388	0.371852071	0.98238363	0.127904929	0.150473865	0.257566945	0.418395022
AA490911	15	3D adult vs. fetal	42.67030392	26.52859985	36.28250422	40.39466602	41.60911969	34.97057694	21.06562623	18.4520925	18.3142959	15.8556682	20.57635735	22.99182529	24.71655205	12.4435305
AA486082	13	3D adult vs. fetal	10.41727609	8.937884327	15.05040142	10.82056372	11.95282018	8.842288293	23.15717253	22.55169547	22.5377778	21.98212686	26.33492887	25.7856523	27.61639941	17.1571581
AA678065	17	3D adult vs. fetal	14.12093138	11.54070062	20.86166208	18.075708	17.83849384	13.73636722	43.1549231	49.75180877	44.95138637	30.65381761	40.86775329	42.55581559	44.82447844	19.44908824
R43509	16	3D adult vs. fetal	11.02563598	9.509595949	15.74133733	14.13916278	13.48520494	10.63815359	27.41149216	22.05072953	25.03729443	27.50714533	32.1008748	21.09382826	22.16972333	15.16640501
N37653	16	3D adult vs. fetal	10.4123206	10.44346779	14.67605884	11.74161678	11.74500654	11.69858601	31.9568203	30.32164198	22.03248851	27.95239629	27.75233699	28.33450066	32.56698428	19.23600632
AA676955	16	3D adult vs. fetal	9.121810178	8.547840872	16.37945858	12.25345162	12.21640163	9.258251347	27.613137	30.15376516	27.7763484	26.77163594	19.30516442	23.91926132	25.65098101	15.57144585
R14692	2	3D adult vs. fetal	0.757198559	0.588063899	0.752811699	0.852655502	1.447179729	0.869563322	0.210407505	8.26E-02	1.409022783	0.795196983	0.577291805	0.581851815	0.140894744	17.15658058
AA489978	15	3D adult vs. fetal	33.66840515	23.40765359	36.22684958	35.83780071	36.1199539	29.2591877	21.60183287	22.74108924	21.96333121	15.76906128	18.73408294	20.2709434	22.79553223	13.91426041
AA443630	2	3D adult vs. fetal	3.179368912	1.141747384	1.766810452	1.116906727	1.631839103	4.49413229	0.100851283	9.85E-02	4.85E-03	0.234847143	3.12E-02	2.15E-02	1.05E-02	9.71E-02
AA027840	14	3D adult vs. fetal	30.77584038	23.58752939	32.62815407	33.05944103	33.60205655	25.63272733	11.00979974	13.09339183	11.2816884	9.089927285	14.0930363	14.98684031	16.74903887	9.439048175
AA456830	14	3D adult vs. fetal	25.58379208	26.39848683	28.15722788	25.87408416	27.40987838	24.08147297	11.37202654	11.65474155	6.607372436	7.389629431	10.76059971	10.57865908	11.60737106	9.428876044
AA453015	13	3D adult vs. fetal	10.03176884	8.709006371	16.03563015	13.10174715	14.03043114	9.884872553	22.13388102	21.94307144	21.95512611	23.03658305	24.90291416	27.82736689	24.69762479	16.16821948
AA074446	13	3D adult vs. fetal	11.85807943	9.620046416	13.82726113	12.87569434	14.04256345	11.73842486	29.21897173	22.22581918	16.8371288	24.23743962	26.33743534	26.81890595	25.69413696	18.03496458
AA027042	13	3D adult vs. fetal	12.73491005	9.459898144	16.51983878	13.49994947	14.93224524	12.43468402	24.22764975	23.72047212	25.83781841	23.88440587	24.95924388	21.01286997	22.26219305	15.37988987
AA629923	13	3D adult vs. fetal	11.09427839	6.096035847	11.63795402	10.20004947	10.48961254	9.430135362	20.68133909	17.84071537	19.87653109	22.21025049	25.34003259	22.25297762	25.08441753	12.30816683
AA460830	13	3D adult vs. fetal	43.40763026	25.89585549	36.23321738	37.85742359	39.87905887	37.77709716	18.35934471	18.97670009	16.46942895	20.66510843	21.27569752	22.24115944	20.1395633	14.54355761
AA454218	0	3D adult vs. fetal	4.470293684	3.093239424	4.937529756	4.688122666	5.072419486	3.72227458	4.705025791	5.029967147	5.2176009	6.528355913	6.43999759	3.661787064	3.143045096	3.120347736
AA040523	6	3D adult vs. fetal	6.155605263	4.388837355	6.934532229	6.949254753	6.883321987	5.156132106	6.972536399	6.239721684	6.685210387	9.087650516	10.97162504	10.44142681	9.712940248	6.973860192
R51346	0	3D adult vs. fetal	3.230511245	3.062416161	3.787520043	3.783285032	3.826003563	2.512202334	9.268892528	11.49108945	6.177160828	7.887574405	8.018087028	10.44726109	9.783512947	0.215474051

AA029964	0	3D adult vs. fetal	3.855847135	4.014123191	5.758888572	4.613362037	4.007280855	3.687657091	7.966349913	10.02474618	7.998306197	7.953245463	6.008361088	14.22552591	13.76169965	9.150938402
AA489219	0	3D adult vs. fetal	3.274998157	2.961717684	3.918052974	3.243068103	3.469099389	3.176498463	3.977503262	4.357159927	3.843713092	6.387649039	5.182503022	4.084539228	4.217440316	3.929360037
AA043133	0	3D adult vs. fetal	3.039842745	3.471121389	5.203529353	4.221352079	4.259092185	3.419382811	7.10915371	6.657783457	7.232430397	9.095892814	7.495998702	8.296677078	7.86458314	5.986265513
AA812973	17	3D adult vs. fetal	15.77248197	10.74549128	18.85394679	18.86663157	16.77333141	12.70379222	31.52455964	28.41615616	25.69771578	32.72534183	34.85110642	31.04591265	32.76410913	19.46276288
AA453471	0	3D adult vs. fetal	3.957168294	3.038926799	2.87937811	4.188692511	4.453834895	3.457945931	9.736208184	11.1890541	2.985624257	6.304114807	6.507046353	13.54093424	11.82320488	11.84074045
AA284693	17	3D adult vs. fetal	14.4127364	9.497839898	13.96717518	12.75585136	13.63554527	14.18625183	22.56815563	31.15842013	22.14580038	30.90223481	28.73160123	32.27184878	29.98195912	19.10255765
N90281	0	3D adult vs. fetal	2.889108899	3.065073021	3.825043424	3.772722446	3.897697917	2.916608408	6.43341783	5.959020585	4.766657998	6.027996022	4.883654532	5.006421597	5.844930445	3.835280867
AA629542	0	3D adult vs. fetal	3.339124505	3.20278143	4.020280022	4.397848138	4.203343071	3.045430554	7.506542168	7.498548839	5.126716959	6.758458157	5.628204957	10.92011362	10.66563175	8.830974583
AA879345	0	3D adult vs. fetal	4.041914565	3.40189177	5.334580535	4.767347184	5.052052168	3.529044952	11.61400851	12.1850373	0.318260832	7.086444187	10.6336761	12.99915052	14.28658079	11.11062364
H37774	2	3D adult vs. fetal	2.582136051	5.751409544	0.826190431	0.749198653	0.950396052	4.924705249	2.83E-02	5.37E-02	0.455840137	0.23068029	0.027217407	9.89E-03	7.63E-03	0.143799652
T97181	2	3D adult vs. fetal	2.848144946	1.762304259	1.780931817	1.662977237	1.930489483	4.429079742	1.876843541	0.587861517	0.977072758	0.374576034	1.401186113	0.980966491	0.307497525	0.977649837
AA454879	2	3D adult vs. fetal	2.588814818	1.895822968	0.788622997	0.683939522	0.868426864	4.58445785	0.128788844	5.49E-02	0.642103913	0.314369938	0.171773759	6.95E-02	6.83E-02	0.364117574
AA147840	0	3D adult vs. fetal	3.111174162	3.689139309	3.781524298	4.096860799	3.959011774	2.732271995	11.10684686	11.11067304	4.334390147	6.745732625	7.498713228	9.714345375	10.05962462	9.682475093
AA757429	9	3D adult vs. fetal	7.054093591	5.363580152	7.988105567	6.839604508	7.370692262	7.981701609	13.9665151	17.25513268	9.348363447	14.61003519	13.1757222	18.11092619	17.6813815	12.40577438
AA490991	9	3D adult vs. fetal	10.98757317	7.790723538	12.35710247	9.885681916	11.00435577	8.698305631	19.30297954	18.58197931	18.34934113	17.52227921	19.95904418	22.6372929	20.13821173	14.51945378
AA422058	17	3D adult vs. fetal	14.71408525	14.84685565	24.49176062	19.94632048	19.29291385	14.68049409	31.53896803	26.94893157	19.67019378	29.90401606	24.82963178	28.86419827	30.12270889	20.6779599
N66208	9	3D adult vs. fetal	8.123797741	6.177962556	10.33188119	7.894725917	8.580898297	6.881934203	15.78244935	17.89542247	17.81439029	14.63969059	16.54037985	19.14257856	19.46042164	12.13187951
AA630776	9	3D adult vs. fetal	9.138119273	6.83233299	11.41953939	9.003209098	9.590093969	8.070647196	16.29858697	16.75035086	16.12331467	15.92787533	17.52684563	20.53155822	17.53930107	12.08947212
AA827287	9	3D adult vs. fetal	8.482649348	7.482270307	9.891746969	9.19984268	9.978725792	8.422494842	39.31448991	30.4334384	11.89952147	17.38709762	17.86731786	24.85588178	34.18834198	20.6039679
AA488094	9	3D adult vs. fetal	7.649134152	14.97955716	13.41766713	10.42093881	9.0717033B8	9.874743168	14.20448178	13.42950914	12.7036246	18.9618	14.49387186	17.34183829	18.41774811	10.91026856
R89715	13	3D adult vs. fetal	9.750099781	17.8705502	18.03616416	13.82091334	12.99735343	14.90421282	19.00984517	16.78228171	15.93191526	23.59033847	19.8478327	20.09882291	20.88101303	13.98761153
AA490501	9	3D adult vs. fetal	7.944415444	7.85976819	11.06033198	9.284097489	8.992468434	7.63431741	17.29784034	18.48394335	14.52922019	15.77575344	14.10902818	23.00662243	25.37702488	14.90184018
N32199	9	3D adult vs. fetal	9.67828656	7.893329723	9.916311099	9.837236279	11.23987563	9.160031823	27.83247395	27.16433957	27.83599929	17.63578421	20.01897529	29.53277745	35.16676364	20.63729373
AA434404	9	3D adult vs. fetal	6.86730459	8.426874472	9.577263322	8.037236874	8.096887575	6.953180054	12.98452113	16.11788081	13.26212785	17.45606094	16.25005553	12.59970441	11.14988041	6.811542045
H93668	8	3D adult vs. fetal	6.036274076	10.94187624	9.036823839	7.358456237	7.155250857	6.336977302	26.28483481	25.54412177	19.80975005	17.76258329	17.42508421	22.88245448	31.60912528	17.69865454
AA292676	7	3D adult vs. fetal	11.09420423	9.867844396	9.549860422	11.52855409	12.53274971	9.824831453	9.876235182	8.317319028	3.210728167	4.436837751	4.953957507	9.622367291	7.40323057	7.83997429
AA464417	7	3D adult vs. fetal	10.40978662	9.6398749	11.95762629	12.77651551	12.8767479	10.07501153	11.05434122	11.16526302	7.715140755	4.628342903	7.257940789	14.12507957	12.84862626	10.51986876
AA442092	7	3D adult vs. fetal	9.965987122	7.370269148	8.883701613	9.441691799	9.667888043	8.214697052	5.48651812	6.31055156	4.641902691	4.599175502	3.885904241	4.692019402	4.440172459	3.114766105
AA026844	7	3D adult vs. fetal	7.769602383	6.538214592	5.137119018	3.572083072	4.086915401	15.10517784	0.62252822	0.701896284	0.261093119	4.191592598	6.49E-02	0.029204697	3.35E-02	0.437058833
AA481464	9	3D adult vs. fetal	7.356616049	9.394727631	11.96871523	9.624488789	9.697819022	7.196159079	18.63468043	20.94766373	14.27769307	15.75348631	11.46384273	12.65501458	9.009332352	10.36580755
T68859	12	3D adult vs. fetal	7.102239287	6.063011273	10.14342977	9.316121437	8.90719198	7.165656319	19.81384726	21.31173502	19.75635729	20.39980475	20.05062771	19.46428757	19.33000277	13.65552685
AA699560	13	3D adult vs. fetal	9.978421471	9.37295778	14.75863288	16.42689227	14.26471651	12.73562928	20.82023846	16.7911717	18.43819663	25.52023654	19.85201903	17.12500341	12.21472729	10.2413573
AA705069	13	3D adult vs. fetal	8.512749427	10.51595376	13.19983017	9.999000301	10.13397175	9.694546833	20.88685524	23.16148711	15.0840977	20.67586612	14.10817428	19.01580429	13.44540219	13.6412039
AA457739	13	3D adult vs. fetal	13.76296688	10.27535708	15.4062123	12.76652957	14.0993498	10.82804945	33.37327991	35.6883041	34.4823112	20.55802853	31.64214174	37.33300573	37.02460042	24.08688689
H99843	13	3D adult vs. fetal	11.42545366	9.860489604	11.08358091	10.09631162	9.902204687	10.73353077	16.79713092	16.69352615	7.127333563	18.73583293	9.995156003	14.60344228	16.5049794	12.29468204
AA399410	13	3D adult vs. fetal	11.49268913	9.868304848	16.50988414	14.49672712	13.23856995	10.91245055	29.72998487	33.11698129	23.43060422	25.72188937	29.04178273	34.63630675	33.29299911	21.29525921
AA443039	9	3D adult vs. fetal	8.661615681	5.473553572	10.7592079	8.268347579	9.771073691	7.541136242	17.93908822	18.28745065	29.34817189	13.16317634	17.21193969	18.81890352	17.62059907	13.67676164
AA164440	11	3D adult vs. fetal	17.82989233	11.87877628	20.35395821	18.48257711	19.46815044	14.70024382	9.30576802	8.984327957	9.868215304	8.433442763	8.752113579	8.431813452	5.330326944	5.313034392
AA446453	11	3D adult vs. fetal	16.55396136	13.61116994	16.50294651	19.54048563	21.22775124	16.02767268	12.86153172	14.28408559	6.56066494	7.913354462	9.798356874	11.52903302	10.6491586	9.31631564
AA280692	11	3D adult vs. fetal	17.40750225	16.18669704	19.04935817	19.71347085	20.1673057	16.35083648	13.47620777	13.91271582	10.59879067	8.217327335	12.09365638	12.02460196	17.01991673	10.08089846
AA031514	11	3D adult vs. fetal	20.58635767	17.50182009	21.03844179	22.39941193	21.41470955	18.33395551	12.90000518	15.02343075	7.652758135	9.941687918	10.4641265	13.93556692	15.68826294	11.53565104
R33154	11	3D adult vs. fetal	15.80929053	13.23696939	13.97191076	14.52813826	14.95312607	16.05415087	15.95001951	16.20484579	10.1215108	7.276840559	13.99489447	13.57306878	14.10166919	10.83686684
AA487452	11	3D adult vs. fetal	13.71327193	19.41866534	12.61831663	12.077349	12.74498437	18.11226999	8.197976148	8.458602154	9.976629011	5.590565736	5.757265048	9.281445194	7.000973633	5.618451692
AA400329	9	3D adult vs. fetal	9.471410325	8.139099224	9.945496246	10.13837609	11.074429	7.250594994	18.57548571	17.4980898	9.303751927	13.39561433	13.86149745	18.50617543	19.11656532	13.69116259
AA454668	13	3D adult vs. fetal	9.047350014	7.5264115	12.60652925	10.81932261	10.34313891	6.424799177	25.89304171	31.51346528	22.93446371	22.57583766	26.88624861	28.81055744	19.75055767	14.91854781
AA486393	23	3D adult vs. failure	0.682030067	0.724440565	0.800620868	0.562299276	0.603381366	1.639697615	0.182124982	0.515575177	4.602814219	1.289031115	0.231530443	0.120506359	0.294243975	1.047822639
R52541	23	3D adult vs. failure	0.402099116	2.047232943	0.476534818	0.419746076	0.364790601	0.848914165	6.08E-02	6.40E-02	0.262420426	1.89326344	0.22723694	0.55767894	0.265300367	0.465287427
AA171613	23	3D adult vs. failure	0.833916304	6.426013019	1.049489533	0.831618144	1.061543998	2.831110499	0.27466038	1.123906401	5.619710529	1.64075918	0.206048231	0.318509947	0.213712273	0.784934532
AA235706	0	3D adult vs. failure	103.2662145	45.16459033	38.30704958	66.22096461	76.19336088	53.88696068	57.38142594	60.53251272	55.52482329	61.56762824	83.23998618	63.03392579	63.61974345	26.90748839
AA668527	23	3D adult vs. failure	1.360133945	6.805032154	1.071215078	0.97529683	1.06310568	3.121521767	0.3985818	0.597438821	4.966520787	1.47871209	0.198743181	0.088330506	5.14E-02	1.584100321
T54144	23	3D adult vs. failure	0.475915725	7.417762102	0.746262622	0.455935776	0.588907616	1.573719963	9.39E-02	0.192484503	1.850866515	0.17162783	6.49E-02	4.08E-02	0.166840739	0.696340115
R14080	23	3D adult vs. failure	0.442812641	7.906110384	0.627950807	0.498814948	0.372466179	1.218619809	9.55E-02	0.107642909	1.600491683	0.379819373	0.14791746	9.50E-02	0.055410162	0.820779184
AA609599	23	3D adult vs. failure	0.359352461	7.143369152	0.569305177	0.366281857	0.341488403	1.345297096	0.187186514	0.10012971	0.27386765	1.420650931	0.166769847	0.275819631	0.221587336	0.609208446
AA489201	23	3D adult vs. failure	0.746247673	7.761267038	0.969230512	0.568039398	0.51445767	1.823393758	0.14443693	0.214598987	2.006534993	0.32146219	9.07E-02	4.93E-02	0.063098942	0.80944025

R08876	23	3D adult vs. failure	0.881300109	6.204436487	1.346594192	1.127374945	1.303511748	1.365140688	0.568537573	0.970149717	1.576770394	0.384565828	0.43816572	0.422480014	0.296461364	1.181668079
H46425	23	3D adult vs. failure	0.448119129	7.549550263	0.42423628	0.384125705	0.304256579	1.948954368	0.12265004	7.01E-02	6.84E-02	1.742654009	0.150967536	0.162468773	0.155852088	0.251147304
R58149	20	3D adult vs. failure	3.946739485	2.221689535	2.687398748	2.29349791	2.994435137	6.00466275	0.139454424	0.213035184	0.815295152	0.482793426	0.717693865	0.297475948	3.81E-02	2.113668202
AA454619	20	3D adult vs. failure	4.670053967	2.36899366	3.285602699	2.811568095	3.530544823	6.168078813	3.288336383	3.22099397	1.915196108	1.919736037	2.762560824	3.92242617	3.716888509	5.217509513
H15445	20	3D adult vs. failure	3.538147066	2.706447087	1.458885277	1.457265129	2.021263714	6.315381377	0.120219632	0.111757383	-3.02E-02	0.467435552	4.96E-02	1.52E-02	9.01E-03	0.41450502
AA705225	23	3D adult vs. failure	1.386636786	6.429576897	1.83711377	1.34483513	1.150500104	2.597429853	0.18852753	0.180935638	0.94755028	0.256955531	0.098583152	4.21E-02	2.79E-02	0.674486801
AA191468	2	3D adult vs. failure	2.174224052	45.10144344	2.069008838	1.631870518	1.77653582	19.32813468	0.8106325	1.339071481	9.778098245	9.717631 94	0.472492022	0.577988082	0.368988511	1.716820958
N64862	14	3D adult vs. failure	0.550596095	12.10838017	1.065306504	0.665682947	0.614517248	3.167265877	0.177514818	0.134938261	0.724810552	0.540552309	0.142613803	8.68E-02	8.34E-02	1.380235208
R45413	7	3D adult vs. failure	0.716578413	26.51952355	1.065046051	0.917779985	0.773891766	6.012284226	0.121785119	0.177364842	0.66590467	2.227657821	8.94E-02	0.189578838	0.126874076	0.639711527
R77293	7	3D adult vs. failure	4.173270014	18.87787869	6.098081459	6.158463331	5.192489399	6.808620493	17.32761828	18.58361324	4.930581248	11.25376919	13.83440333	12.64389145	12.77350206	10.14808669
AA436187	6	3D adult vs. failure	7.730845580	34.64438609	9.740301388	7.582520052	8.233604749	16.4559413	15.01390271	13.59205508	9.447023349	23.31166756	9.068747717	12.4718263	13.46398542	8.219025894
AA676470	5	3D adult vs. failure	23.09461759	12.79749882	19.67261192	19.83195374	25.31283192	19.5015243	30.08495758	24.12483143	26.19627013	36.68374593	38.36383944	30.07336868	29.97197759	16.93190315
AA443634	23	3D adult vs. failure	0.483674724	6.507766668	0.834546801	0.602237179	0.563081629	1.705323839	8.40E-02	0.248574668	1.87808441	0.506000681	0.115582035	2.84E-02	1.86E-02	0.530955426
AA664180	4	3D adult vs. failure	77.28842805	43.66418943	36.30704958	68.26659959	73.01397471	54.50243711	36.06326367	31.7886287	31.69253658	48.48811822	47.96493814	35.23111673	43.94952253	18.50826673
W58658	20	3D adult vs. failure	3.738957043	1.157647486	1.625298607	0.567045634	1.362263758	5.290498458	0.173902417	0.153440018	0.620011724	1.529093442	0.023894127	1.68E-02	1.45E-02	0.702231009
H54029	2	3D adult vs. failure	2.518425668	78.64764129	1.455767277	1.89558391	2.244043815	23.66020328	0.247467714	0.188125663	0.227984638	5.912011779	0.223991418	0.399206145	0.253395926	1.366292307
H73724	11	3D adult vs. failure	0.794565272	15.90467626	1.124742532	0.660242857	0.686814595	4.296719254	0.088614629	8.03E-02	0.231628251	1.683504664	0.117675022	0.155606077	0.129032488	0.444812754
T70031	2	3D adult vs. failure	2.006155548	48.92472369	2.789740103	2.01477414	1.746671803	15.29766287	0.277245911	0.148769574	7.22E-02	6.834546017	0.22727827	7.26E-02	4.65E-02	4.39E-02
AA481758	0	3D adult vs. failure	123.6211844	61.20693911	90.30704958	92.35920856	102.0498037	54.85301063	69.05370315	37.39817347	42.70517498	58.7187498	64.37630302	40.66376745	37.7884949	23.04551033
AA521431	0	3D adult vs. failure	125.2413904	56.77999766	90.30704958	93.6827224	100.6362158	54.85301063	61.83605818	43.27436449	55.26120705	77.90743727	76.13351238	40.95637623	42.00937516	25.13021983
AA446103	23	3D adult vs. failure	0.338624303	7.652704012	0.571045963	0.349989394	0.406883851	1.434663101	0.104636512	7.03E-02	7.95E-02	1.215681577	9.41E-02	0.149593049	0.125073625	0.646399798
N92646	5	3D adult vs. failure	30.42865911	14.69709888	29.90172172	26.59339066	28.56872605	26.04183434	28.06784683	30.96204311	27.96134068	35.82918822	30.95508803	38.04823224	35.37693112	18.89015759
AA453789	18	3D adult vs. failure	2.044150452	8.495958017	2.328026154	2.572167528	2.212159729	3.457082607	1.808404003	2.622249449	2.812909827	1.746220767	2.577090446	1.40223369	1.246611512	3.36017901
AA425299	18	3D adult vs. failure	7.887770078	3.918963058	10.38387894	7.660089272	8.794304531	7.329938113	13.08032469	13.71772041	14.26834182	16.54871153	17.41154591	18.66745962	13.52405931	12.53625711
AA868929	18	3D adult vs. failure	1.98091121	9.937368938	2.013089465	1.471073914	1.420828724	5.418655459	0.618942483	0.614412924	0.22361388	0.834682507	0.635222734	0.970619638	0.37352773	1.256217182
R60019	18	3D adult vs. failure	2.116044289	8.525464296	1.047037018	0.928042539	1.092727505	5.235772895	0.119641725	0.116811729	0.259384551	3.00499051	0.182169515	0.151089307	0.155852498	0.941525731
AA857343	18	3D adult vs. failure	1.650037418	6.297808737	2.426871459	1.704623126	1.741966813	3.845429741	1.901017437	2.499976812	0.714479672	1.232686475	0.932256949	1.974939699	1.554741816	1.864138006
AA481438	18	3D adult vs. failure	2.573933498	8.391910909	2.445625176	1.893217317	1.76341218	6.043734557	1.201789066	1.353486237	0.871369975	1.070764965	0.757366565	0.88003401	0.80663623	2.827464886
AA399674	18	3D adult vs. failure	2.130783417	9.164685436	3.388970859	2.354039954	2.279993542	4.872785488	1.105347869	1.501678874	0.866552209	0.74069806	0.55317612	0.938530357	0.733003255	1.646381253
T98887	18	3D adult vs. failure	1.100740148	8.759420509	0.936100822	1.100317022	0.603584044	3.484794007	0.124035558	0.312987764	2.343639547	0.401768082	0.207652428	0.506081312	0.156684645	0.746649314
AA676404	18	3D adult vs. failure	1.601596727	7.015197498	1.932547665	1.820935977	1.60852363	3.313612045	2.36641611	3.338382636	1.58773702	2.194204209	2.061478452	3.607585625	3.37665162	3.542744541
H15747	20	3D adult vs. failure	3.703358787	1.841236561	1.31983711	0.468266359	1.579189807	6.384201738	0.287743257	0.229134482	0.372656688	1.777298932	4.68E-02	5.65E-02	0.041067988	1.289813816
H16958	16	3D adult vs. failure	4.911652574	2.605777016	6.153238607	3.258278988	3.421877751	2.976025283	1.894931477	3.000533791		8.633043094	3.547286301	1.619498817	5.733681715	1.263158823
AA936783	14	3D adult vs. failure	1.342031028	13.57092172	1.952974132	1.334954568	1.22240126	4.341547085	0.389167344	1.499581511	10.64077637	2.384094632	0.13911189	0.66026872	0.277728232	1.169970181
AA884709	18	3D adult vs. failure	2.262402026	7.467527538	3.158373807	2.652355076	2.663007264	4.51372877	2.198015928	2.056757874	1.718600124	1.980966589	2.355838772	0.830886735	0.335287796	4.749490887
H24668	18	3D adult vs. failure	1.395480263	7.059371875	2.232669864	1.921932565	1.963472023	4.014560107	0.201982284	0.219962769	0.751879444	0.612830980	0.153838277	0.734614109	7.99E-02	1.552613702
AA884403	18	3D adult vs. failure	2.032526808	8.508216003	2.408859336	2.267218044	2.281983003	4.451691143	2.103460769	2.672782071	1.300637697	1.099433595	1.733627895	1.274946177	1.242053454	2.973138744
AA404819	19	3D adult vs. failure	0.721996555	11.04039228	0.849034927	0.475083665	0.645471218	2.92914746	0.15139684	0.357518214	3.52385316	0.59841884	0.179573378	0.18311414	0.182224032	0.75943341
AA598611	19	3D adult vs. failure	0.473381741	9.658226618	0.486642718	0.382776293	0.327497562	3.321739	0.330074441	0.226908429	1.350802266	1.655404779	0.200113403	0.186066173	0.124232788	1.678765306
H72875	19	3D adult vs. failure	1.047526507	9.965593019	1.751417648	0.96145731	0.718146053	3.174877726	0.179741117	0.13627264	0.473352965	0.490771985	7.61E-02	4.42E-02	4.34E-02	1.006169064
H63381	19	3D adult vs. failure	0.444705701	8.608586298	0.460617918	0.347764767	0.327526489	2.835780951	0.163571849	0.12317033	0.475111201	1.012711843	0.119954697	0.119944556	0.113665578	0.624304289
R39221	19	3D adult vs. failure	0.63457623	8.80359405	0.916404688	0.568441587	0.563632981	2.21717036	0.186857806	0.316450834	0.432784395	2.516001904	0.671600175	0.711850096	9.23E-02	1.36227562
R02348	19	3D adult vs. failure	0.380957115	8.723284539	0.689843744	0.430660409	0.314907846	1.628841297	6.20E-02	0.206438723	2.150640832	0.255419744	3.89E-02	2.30E-02	3.21E-02	1.140643608
R51635	19	3D adult vs. failure	0.319821036	3.205091988	0.499133148	0.341800718	0.398772973	0.702868877	3.03E-02	0.363376883	0.731237551	0.726165229	1.322490099	1.631249806	0.224516258	6.956746548
R33031	19	3D adult vs. failure	0.309199103	9.871901353	0.870719013	0.499982302	0.446815901	1.737947999	9.98E-02	0.162383993	1.927344826	0.62547274	0.062236534	3.12E-02	7.42E-02	0.817377295
AA412053	18	3D adult vs. failure	2.173462159	8.658749377	1.560525939	2.335301885	1.60001113	3.312435004	0.204788914	0.413840453	1.346709648	0.357745167	1.241913181	0.757293992	0.22139368	1.438145557
AA001897	11	3D adult vs. failure	0.707399819	18.58199189	1.276833043	0.839394093	0.698445289	3.44857855	0.348034638	0.171387974	0.207561282	1.765380433	0.543185967	0.658836523	6.58E-02	0.748430068
W81191	18	3D adult vs. failure	2.035130827	9.564497621	1.470028438	1.278460058	1.466681545	5.442558928	1.790574222	1.899247237		1.807214492	0.346309978	0.222762323	0.107712129	1.34541522
AA430552	16	3D adult vs. failure	6.704743363	3.912744879	7.308427625	6.182487835	6.715639324	5.892347254	2.91607872	3.076041003	2.629697507	4.426370714	4.729925458	4.71187164	4.531947561	3.70805471
AA394130	20	3D adult vs. failure	4.197684546	1.950946844	3.399747789	2.792799271	3.308148606	6.579661928	0.703542309	1.005637145	0.525583509	1.216578849	0.691717084	0.376548847	0.27857931	0.635247713
N92864	20	3D adult vs. failure	3.064889092	1.120230555	1.255047434	1.028875207	1.597698392	5.129597747	0.079866033	0.112472409	0.251854929	0.452282211	0.101581389	0.227029764	0.237170156	0.466949248
AA457123	20	3D adult vs. failure	3.825435082	1.372454684	1.737581719	1.805411888	2.242579776	5.776097858	0.216922531	0.155819343	0.364362163	0.723386383	0.133198078	7.45E-02	0.10617339	0.52975191
R43320	19	3D adult vs. failure	0.534524185	10.13392358	0.907640341	0.334762409	0.297154033	3.300796986	9.13E-02	7.59E-02	0.458730796	2.051917813	0.104074549	0.137491428	0.106125471	1.014817239
AA670430	20	3D adult vs. failure	6.033985543	2.411069781	6.490413776	5.227597585	6.00486788	4.956892131	9.679698892	6.863278692	5.717565814	7.613099059	8.65181804	7.995091865	4.8996271	5.249095284

H65066	11	3D adult vs. failure	0.932240825	19.08305372	1.062651862	1.323524085	0.843208322	3.42676519	0.34278548	0.256922183	0.586615168	4.298907537	0.476155759	0.479705389	6.74E-02	1.020767749
AA458785	11	3D adult vs. failure	1.024544481	14.76220711	1.673515465	1.016303139	1.117923958	3.660946499	0.785442166	1.506491022	9.808733277	1.828902106	0.920171532	0.658849251	0.698071385	1.994825669
AA485871	11	3D adult vs. failure	1.240425485	16.32124039	1.919684978	1.051475658	1.243632378	4.685742561	0.597816889	1.768341753	11.84398613	2.137826917	0.262843105	0.254992284	0.126560693	1.303743017
T39411	14	3D adult vs. failure	0.683415906	14.1280462	0.827762784	0.665895165	0.776309728	3.661139864	0.396231188	0.296818072	0.324548562	1.969945161	0.169337341	0.268104021	0.247950339	1.580361635
R00855	20	3D adult vs. failure	4.116866708	2.545089683	2.768201859	2.656761885	2.788015121	6.090967819	1.087364016	1.024237951	0.766054603	0.975300349	0.539506121	0.412648188	0.154076211	0.733947191
H98666	16	3D adult vs. failure	7.496261053	3.423039388	3.917399183	3.208047795	4.021338011	7.436138134	2.109706251	2.760481372	1.275784185	1.529882868	1.784602477	2.774145853	1.966370837	3.844630747
H72028	14	3D adult vs. failure	1.122387248	10.87725529	1.107269289	0.894651185	0.693097551	5.481280912	0.181183944	0.425147123	0.857472955	1.001641974	0.163941215	0.987420557	0.351793709	0.907756492
AA679177	14	3D adult vs. failure	0.813601988	11.3980019	0.884729818	0.736756843	0.624488657	3.353148409	0.348135481	0.500333332	1.326832638	4.439877031	0.32838439	0.421386335	0.341562345	1.648279914
N21578	14	3D adult vs. failure	0.493867961	12.22018711	0.630068988	0.332239214	0.452874405	3.48979683	0.168101047	0.117805103	0.409669051	1.325818704	8.67E-02	2.22E-02	2.56E-02	0.494287316
AA007419	14	3D adult vs. failure	0.640548282	10.87290798	0.573707373	0.426598512	0.390973266	5.000691355	0.175440269	0.12813069	0.39815608	0.955234641	0.161389912	0.196276298	0.170532566	1.071322897
T49657	14	3D adult vs. failure	1.478439588	12.2454622	1.66172702	1.085853458	1.158150176	4.728340076	0.308720498	0.570684257	4.039761403	1.234676181	0.125959577	3.27E-02	1.97E-02	1.338939336
N38959	14	3D adult vs. failure	0.96668518	12.21521754	1.222240919	0.390241965	1.036587317	3.877992922	7.55E-02	1.055602229	7.313895345	1.268404297	0.307559568	0.724991758	0.070393719	1.035781385
R51912	14	3D adult vs. failure	0.931665691	13.32666832	0.554065456	0.584470901	0.545379233	4.794685202	0.30750311	0.157092387	0.297430002	3.304783027	0.316950074	0.28696647	0.164570109	1.141663339
H90415	14	3D adult vs. failure	1.027933738	14.40938868	1.543560847	1.015016198	0.913466897	3.697172386	0.332923734	1.116687454	9.324562689	1.997045708	0.350224199	0.100034162	8.78E-02	1.169187709
H41489	1	2D/3D adult vs. fetal	4.027357986	2.097422239	1.726349783	1.413362414	2.223616983	7.753840206	0.135065339	0.112846912	0.31963146	0.540685076	0.105448274	2.38E-02	2.54E-02	0.533599747
H15456	1	2D/3D adult vs. fetal	4.015366257	7.010456083	2.974647228	2.512493381	3.106940998	8.704676882	0.118493184	8.15E-02	0.670523766	0.212383873	9.91E-02	0.048036092	3.56E-02	1.044685298
W45415	1	2D/3D adult vs. fetal	5.512363827	1.065216681	2.691703268	2.027056421	2.568973782	6.815995267	0.187478377	5.20E-02	0.722058962	0.692564761	0.293080465	0.189933858	7.54E-02	0.655830442
AA447751	1	2D/3D adult vs. fetal	3.707303465	4.760241073	2.223590667	2.437972778	2.631458156	7.623606101	0.78398734	0.786015622	0.528464235	1.211081391	0.239987152	0.17186979	0.272898223	1.030511383
AA487486	1	2D/3D adult vs. fetal	4.21336598	4.045765801	3.015283294	2.286202013	2.768946605	8.048478397	0.534940441	0.950108402	1.666390776	0.795295661	0.359287561	0.193793075	0.198174164	1.934418861
R56604	1	2D/3D adult vs. fetal	4.165186307	3.846779908	2.973815371	2.369929936	3.1509812	7.458099126	0.3460236	0.408195433	1.083709289	0.653908131	0.60487089	0.489048814	0.395606236	1.682176098
T65772	1	2D/3D adult vs. fetal	4.467663913	2.538286605	2.543615768	2.462140712	3.002686448	6.741762884	0.25838637	0.106483973	0.235991068	0.28337251	0.46880307	0.109303057	0.116698413	1.388384089
H15085	1	2D/3D adult vs. fetal	4.532070686	2.552606255	1.874728575	1.797926653	2.249323536	7.10815384	0.157580914	0.114766422	0.508468022	0.673401507	0.17757899	6.65E-02	5.09E-02	0.136004744
R91295	1	2D/3D adult vs. fetal	5.7522625	3.54542013	2.945120833	2.584363772	2.826103944	7.68061273	0.212944574	0.159174688	1.555313951	0.607244235	0.169955202	0.225692165	0.172935079	0.384976032
T61256	1	2D/3D adult vs. fetal	5.260364	1.641968589	1.819566112	1.625856706	2.432049565	6.879367501	7.25E-02	0.151774275	0.781713647	0.145248528	8.64E-02	7.32E-02	6.14E-02	1.055956615
AA405731	0	2D/3D adult vs. fetal	2.090454022	34.42033666	1.664515998	1.304288382	1.293105338	10.6339838	0.195114794	0.138469531	0.339111129	3.35219508	0.125085325	0.189941763	0.145965169	0.612669025
T71879	1	2D/3D adult vs. fetal	4.193732669	4.210242665	1.985666697	1.946658119	2.195662508	8.143137484	0.128933321	0.137341443	0.390507256	0.407085926	0.114225823	4.49E-02	2.40E-02	0.521752069
R59927	1	2D/3D adult vs. fetal	4.826206077	4.383351971	1.602344146	1.52557434	2.192290627	7.925477266	9.10E-02	0.107392035	8.50E-02	0.442229621	9.27E-02	6.81E-02	9.43E-02	0.347354052
AA496780	0	2D/3D adult vs. fetal	1.514704846	26.44459843	1.135159078	0.912692615	1.001084793	10.48006188	0.110593994	0.022497663	0.534503826	1.752767599	0.281792243	0.415100922	8.75E-02	1.131163315
AA176688	0	2D/3D adult vs. fetal	0.883613375	18.90708911	0.969072645	0.759370466	0.781878516	8.758214974	0.178382771	0.144369523	0.781888663	1.331812939	0.187224487	9.28E-02	6.62E-02	0.650312165
AA439163	0	2D/3D adult vs. fetal	1.145286483	19.39007997	0.91032868	0.78908737	1.062812492	7.470804283	0.23227833	0.236489348	0.254656187	2.416941823	0.161958036	0.3988222	0.305725744	1.256999654
AA428778	0	2D/3D adult vs. fetal	2.765936237	23.81604244	1.650059764	1.291875843	1.526455491	10.05785097	0.105802992	9.28E-02	0.486961912	2.193301754	0.163689027	0.132361001	7.25E-02	0.611181122
AA463225	0	2D/3D adult vs. fetal	1.805467836	22.97689102	1.545226165	1.416083191	1.289595725	9.717200851	0.276223908	0.152997555	1.039475243	2.155030865	0.416397656	0.329192564	0.19424438	1.916291602
AA485426	0	2D/3D adult vs. fetal	1.389325695	25.67139954	1.27039293	1.069742478	0.998457685	9.659144828	0.289852714	0.373831514	0.416062891	1.661826021	0.22603134	0.194563224	0.121355589	1.266933317
WJ4785	0	2D/3D adult vs. fetal	1.745341956	27.39946025	1.287668441	1.305011386	1.416492719	11.04790889	0.290711332	0.28058816	0.290834133	1.405085787	0.21336519	0.172813844	2.02E-02	0.962779151
H84982	0	2D/3D adult vs. fetal	1.533032723	28.30131199	1.047589817	1.549633971	1.23688491	9.828318448	0.131639592	0.139838813	0.317575218	2.016302257	9.62E-02	0.376525133	9.28E-02	0.503147875
AA504615	1	2D/3D adult vs. fetal	4.050257188	3.625356301	2.199703889	1.941384876	2.75118269	7.641495993	0.260955437	0.211651667	0.911938546	0.668556083	0.134885637	0.121344263	0.121161662	1.972320295
H94487	0	2D/3D adult vs. fetal	1.645750443	22.47903843	3.594620042	1.028845936	1.681688149	8.286429124	0.176887945	0.365682094	0.630918749	2.620578978	0.183460578	0.419558641	0.179194474	1.879826661
AA448959	9	2D/3D adult vs. fetal	3.124990125	4.592355812	3.899374735	3.173734392	3.451263958	6.793092921	2.916692897	2.932033692	1.637325243	13.34753362	0.628009453	0.190111068	0.132777658	2.07701127
AA070358	2	2D/3D adult vs. fetal	8.012667475	1.564102379	1.883538283	1.584998753	2.642393389	9.46000834	4.54E-02	4.12E-02	0.387054172	0.116479427	4.69E-02	2.03E-02	2.61E-02	0.244403144
AA453401	1	2D/3D adult vs. fetal	5.692934592	1.526593829	1.905652363	1.904350696	2.206453207	6.672888766	0.167660345	0.214972768	0.222252985	0.203904483	0.242997298	0.251569524	0.177121691	0.804209416
N66737	14	2D/3D adult vs. fetal	24.90073908	0.393334078	1.095420779	0.556298638	0.923759381	3.442649218	4.20E-02	7.41E-02	0.257268707	26.36051857	1.048190846	0.091475566	0.104092386	0.79476014
AA668180	9	2D/3D adult vs. fetal	2.115740805	12.05725753	2.14570443	1.488045473	1.870792054	5.34373246	3.198631019	7.187377922	29.76323485	10.64207727	2.781542964	3.990641982	4.044434302	4.668184378
AA857131	9	2D/3D adult vs. fetal	0.152032873	0.207460704	0.266997471	0.210685319	0.132387162	0.357440795	0.223573307	9.63E-02	0.758187241	23.03526077	0.070686238	3.60E-02	4.56E-02	0.878719343
AA479102	9	2D/3D adult vs. fetal	2.295197392	25.01632531	3.681214605	3.425928026	3.02851033	6.49611205	6.652949035	8.120715713	3.236793772	11.51815786	4.73539654	7.003983588	5.605548634	5.888262807
AA456077	7	2D/3D adult vs. fetal	7.731170292	4.509291885	4.761631135	3.922605205	4.876603995	11.60187555	1.027878631	1.325946518	1.245447159	2.318900816	1.481005766	0.592776193	0.435487259	1.471236654
R87497	7	2D/3D adult vs. fetal	7.553857203	4.516297687	3.008217917	1.067794466	4.393661357	12.60899243	0.319714784	0.441276786	1.241443943	2.794766846	5.52E-02	2.59E-02	7.17E-02	1.35489803
AA718910	7	2D/3D adult vs. fetal	7.12414318	3.548431737	3.928552441	3.557814728	4.383101911	10.82120865	0.771846813	0.859478249	0.801090192	1.362044268	0.616842421	0.429437896	0.408760631	1.063445986
AA406269	7	2D/3D adult vs. fetal	5.887777587	6.493700059	3.976570613	2.359009775	3.447900579	11.90806873	0.270836576	0.224358482	1.06080255	1.245736874	0.124219479	6.82E-02	9.79E-02	0.972478072
N74623	4	2D/3D adult vs. fetal	0.738692411	0.885532206	0.507569165	0.423927496	0.405894222	1.326758097	0.147826314	0.155576422	0.39183835	7.661750863	0.116891312	4.48E-02	3.99E-02	0.667478091
H99364	6	2D/3D adult vs. fetal	4.854446832	3.967945222	3.173155342	2.53020259	2.826020625	9.199591084	0.647513791	0.368774275	1.09104024	1.578071783	0.315822232	0.108503159	0.10216456	1.465520888
AA447684	6	2D/3D adult vs. fetal	3.976408745	14.43916072	4.763738151	2.471682235	2.732135077	8.763139341	0.497110821	0.537175623	0.525424572	1.459911244	4.89E-02	2.74E-02	5.04E-02	0.735202872
AA282301	6	2D/3D adult vs. fetal	5.741753049	2.638926534	3.526955597	3.116535142	3.442563042	8.08592064	0.27173204	6.68E-02	0.520517404	3.191486412	0.722232552	1.277477858	0.144496875	2.236318764
H99568	5	2D/3D adult vs. fetal	1.455459708	29.42112357	0.93818073	0.705663294	0.91405074	9.587415089	0.227706892	0.166835375	0.379322092	7.180929201	0.205434573	0.247795568	0.187784708	1.219437291
N53512	5	2D/3D adult vs. fetal	1.865690833	27.43765749	1.437831064	1.488193294	1.489514434	11.66412529	0.693352824	0.85093842	0.861714576	5.362013301	0.476594275	0.673037164	0.544521467	1.733748427

AA683321	5	2D/3D adult vs. fetal	1.133236265	27.22345134	1.394968388	0.968385381	0.71972912	8.309498154	0.246596976	0.176033115	0.293208249	5.563771987	0.123251357	0.226202587	0.181288584	1.448843062
AA608557	5	2D/3D adult vs. fetal	2.577273943	29.04646478	2.807387159	2.029202014	1.932689792	8.478935818	0.385872018	0.363796565	0.952099841	3.879470723	0.316768838	0.312030768	0.238667939	1.726847773
AA757764	2	2D/3D adult vs. fetal	5.690914198	3.357895765	3.861101886	2.752079821	2.955536226	9.043391314	0.297379076	0.165726325	0.58261567	0.440905543	0.372520434	0.382055076	0.145493758	0.988760934
AA406064	2	2D/3D adult vs. fetal	6.957108219	3.855088049	3.928274978	3.830306615	5.143577569	9.248530935	0.963197456	1.184935842	0.779087405	0.891603525	0.966885185	0.579894623	0.330253413	1.152159636
N54596	20	2D/3D adult vs. fetal	6.411864475	40.45884114	12.32476105	8.740060641	8.361428458	11.67500348	29.7307313	23.80460158	15.15010606	61.1100551	21.20150657	23.73876744	23.56652312	20.42284808
AA481988	7	2D/3D adult vs. fetal	6.029716769	7.619281816	3.801345873	3.597022308	3.988124217	12.08244483	0.93030089	1.67920494	1.521390918	1.602447026	1.594545777	1.393612985	0.586783337	1.454014827
N62394	3	2D Marker adult vs. fetal	2.436813979	3.687865805	1.411911686	4.045770491	0.844150341	2.656973499	0.292745156	0.145445316	0.919547636	0.486071328	0.618336638	0.192065885	0.209279951	1.61964171
N26146	3	2D Marker adult vs. fetal	3.44995341	2.759942512	3.751806548	3.90090485	3.142378907	4.04494813	0.36264957	0.293240313	1.191190173	0.634599551	0.725999262	0.465863026	1.173321753	2.675970931
AA496678	3	2D Marker adult vs. fetal	7.001100643	4.03568563	5.297409563	3.722363923	5.160647823	10.19230959	0.319441345	0.257667574	0.478071395	0.622386812	0.132931879	1.95E-02	2.60E-02	0.840188206
AA400973	3	2D Marker adult vs. fetal	2.89346803	4.47076738	4.470210209	3.193476491	3.257043268	4.020015252	1.534002053	1.714822504	1.436906175	1.048156955	1.254760066	0.941922627	0.722913801	1.95299852
AA497027	3	2D Marker adult vs. fetal	1.902250483	0.578162102	3.922092662	2.407065102	1.286782668	2.167496735	0.438460922	1.508084468	0.372150077	3.020669536	0.359906923	0.227232464	0.14420936	1.043280575
N04508	3	2D Marker adult vs. fetal	2.115795984	3.276856168	1.90235047	5.314258483	2.788331395	3.540796101	2.009112662	3.452207016	0.792805621	1.301784349	2.539009334	3.500903196	3.083422958	4.592914592
AA033564	3	2D Marker adult vs. fetal	5.316788851	2.720044947	3.133883202	2.683871598	3.532284326	8.161295359	0.069421832	0.161683182	0.323575075	0.250293874	0.17400072	0.226600648	9.11E-02	0.871274685
AA446108	3	2D Marker adult vs. fetal	2.070301935	2.211041944	3.792769943	3.324684095	3.975402685	2.756568614	0.769688027	0.390512087	4.097425592	1.207299335	0.354854654	0.436418383	0.134273293	1.258329856
AA159577	3	2D Marker adult vs. fetal	4.746090464	4.989070689	4.287813007	3.593768792	3.816425244	7.786959581	0.446474167	0.379318202		1.090721231	0.206696214	4.62E-02	3.77E-02	0.916706477
R36958	3	2D Marker adult vs. fetal	4.749539144	3.400698787	5.624793808	5.234422192	5.286395351	4.078816944	5.23E-02	2.39E-02	0.262096407	0.139051554	0.101530951	5.47E-02	4.12E-02	0.458047702
AA629808	3	2D Marker adult vs. fetal	1.920163507	0.7909906	3.923258324	3.457491381	1.13174846	1.710017559	0.630754179	1.081371373	11.12264238	0.264354582	0.128126994	0.765515506	1.149526797	3.042979924
AA482087	3	2D Marker adult vs. fetal	6.194625221	4.238881966	3.254611387	3.315340662	3.879401032	8.171254871	0.205039081	0.253788068	0.282480027	0.493737706	0.156656574	7.90E-02	5.28E-02	0.55095689
AA669314	3	2D Marker adult vs. fetal	6.809538669	4.133060912	5.329740351	3.780076886	4.424021689	9.385883026	0.683742215	0.808392548	1.16372394	1.602884914	0.442885133	0.570227867	0.280240919	0.712164672
AA775241	3	2D Marker adult vs. fetal	6.014247582	4.222679024	5.909433903	4.651935693	4.529769385	7.71821765	1.416874982	1.846188647	5.577800931	1.344689512	0.880185899	1.252484239	1.424573602	3.384055572
R73584	3	2D Marker adult vs. fetal	2.788220082	5.744755801	4.174172878	3.110031036	2.840522285	3.830886431	1.02446963	0.935468411	0.803404707	0.386215322	0.286257374	0.109893655	7.53E-02	1.275588944
H28984	5	2D Marker adult vs. fetal	2.892697648	3.831327794	4.337837094	4.289702271	3.642114467	3.028043454	16.59350558	16.18200978	9.172410684	13.1191606	14.4503945	11.12950391	7.932771347	9.633167025
R44202	3	2D Marker adult vs. fetal	3.843410664	2.636358787	3.786734981	3.415990384	3.473443896	3.189323952	8.69E-02	4.38E-02	0.253533697	0.166629344	0.117904267	0.101127842	0.103847056	1.059451655
W70051	4	2D Marker adult vs. fetal	0.460743655	0.435637611	0.599111691	0.634647941	0.684508861	0.518398472	21.76297737	20.04405194	14.91138327	18.87697976	19.87488409	28.04573416	30.08594829	16.42056169
AA401972	5	2D Marker adult vs. fetal	4.694309329	5.237266898	4.803264368	6.3957827	6.187809657	5.273916388	14.92249066	16.42885435	5.611565027	6.854697045	13.81655051	16.92468552	18.75158154	15.74988433
AA236164	5	2D Marker adult vs. fetal	4.469190029	5.999132856	6.533218517	5.791985355	6.205993927	5.089326434	20.21677625	18.79310438	12.57687929	11.95096823	16.38247541	20.16185377	20.77840532	15.16538035
R22412	5	2D Marker adult vs. fetal	3.322360737	8.924589287	5.257612204	4.2528886	4.433039078	4.372991796	15.72505574	17.55060555	15.82655015	13.78588969	13.30933358	14.5213203	15.01308178	13.15195793
AA424804	5	2D Marker adult vs. fetal	6.72316462	4.945597359	6.844706059	7.100383442	7.690736998	5.712216735	14.70872577	15.97533753	10.78900463	13.01835661	12.64309311	15.36509292	16.14117886	11.65209772
AA669443	5	2D Marker adult vs. fetal	3.473141273	5.642074949	5.804136792	4.780513461	4.819190027	3.624913174	16.40914268	14.22534282	9.970977757	16.06031801	15.3193005	15.5104445	16.01732542	11.20069358
N69669	2	2D Marker adult vs. fetal	1.47268428	1.500609747	1.577772215	1.63158512	1.673578671	1.20775425	11.40467488	11.65322402	6.372712462	5.538040372	6.533556933	11.1584167	11.60779004	8.597842758
H24316	4	2D Marker adult vs. fetal	4.097759837	4.571809686	6.670594998	5.519559327	5.302346748	4.332423617	16.63164161	15.705815	15.68021927	15.56699579	19.40991358	20.01447688	19.29795097	0.497864329
AA074224	3	2D Marker adult vs. fetal	2.916040437	42.17808573	3.996084321	3.421263628	2.977614141	15.7136877	0.333624301	0.375913694	0.378626744	3.784608939	0.327739524	0.489769841	0.322976295	1.313102294
R36571	4	2D Marker adult vs. fetal	1.22086245	0.697979245	1.245173941	1.105008283	1.434340053	1.173334441	15.28422925	17.32979473	15.34324385	15.25547675	18.55691798	14.2447373	10.72233164	1.060847719
AA056465	4	2D Marker adult vs. fetal	5.113683679	10.12778251	5.977620638	5.183053806	5.656909478	5.941478667	18.42366544	15.89605854	8.341211937	14.29501218	17.71874921	13.05741368	16.65715974	11.02252852
AA633911	4	2D Marker adult vs. fetal	5.047585747	3.541329987	5.859700035	4.917562173	6.033089317	4.589863101	22.16035468	22.782521	30.6526342	14.91020808	19.44240872	23.66144082	26.37266059	17.24459371
AA457165	4	2D Marker adult vs. fetal	4.59919155	2.634463051	5.207796008	3.444600254	3.688657977	4.888009989	21.68263476	12.69269947	15.02783414	18.54841663	19.13660866	15.98507842	11.33190117	10.09290381
AA459104	4	2D Marker adult vs. fetal	4.790849028	2.49717776	4.875933559	4.052837562	4.532277466	3.791654155	15.2195866	16.20194954	24.24665432	13.86213005	18.26771629	15.71979923	13.29493507	12.57597877
R40212	4	2D Marker adult vs. fetal	6.695606523	6.536605083	5.50014925	4.878309221	6.754823259	6.404118354	14.5790754	17.12092824	17.93072196	13.93477495	17.42255813	17.93870181	18.31265802	2.2735197
AA088476	4	2D Marker adult vs. fetal	3.826186364	2.338234619	4.05845178	3.573649092	3.942866534	3.486560771	17.74782242	18.69369476	14.58097392	16.97637563	20.8754483	20.68533459	19.28034455	12.52733321
AA663310	5	2D Marker adult vs. fetal	4.888675925	6.427535974	6.884450204	7.059542516	6.212911071	5.167684215	18.34330926	18.98378867	6.057610695	11.98270843	15.69453268	15.19045985	18.66892542	11.4721218
AA455840	1	2D Marker adult vs. fetal	2.29694825	2.246509212	2.490940902	2.65444359	2.528689751	2.024350781	18.47809437	17.61623038	7.452925146	8.994012339	9.980063651	12.54788533	16.22279878	12.11311137
AA496878	1	2D Marker adult vs. fetal	2.320206872	2.464809211	2.708923499	2.591526171	2.820757806	2.528269298	5.246470108	6.492363676	7.23111917	5.567148567	7.297448165	6.519473799	6.047516043	4.881896262
AA085749	1	2D Marker adult vs. fetal	1.134352576	1.145219423	0.919694908	1.213892433	1.191952306	1.148805945	10.15319844	10.58867058	3.720477616	4.092990024	7.481499363	6.388572117	7.203726545	6.728320601
AA425755	1	2D Marker adult vs. fetal	1.256028253	1.42629856	1.456101682	1.538378189	1.521167266	0.95599115	13.24455202	12.89357607	5.034714528	6.268355719	9.092441534	11.59487571	11.62952447	9.529595044
N52350	1	2D Marker adult vs. fetal	2.159542225	2.651354597	2.427419475	2.256040758	2.484151334	2.217983077	10.61031686	10.79705267	12.63852019	8.676479986	8.976553332	3.221438906	2.335184673	1.494699625
AA630104	1	2D Marker adult vs. fetal	1.898590697	1.850429013	2.323116997	2.265340283	2.543886171	1.567701571	12.7227255	13.72069077	6.71563807	7.938526099	9.913277923	14.18776319	13.90026724	11.35565277
AA454954	1	2D Marker adult vs. fetal	1.85505455	1.874219048	2.289078847	2.076882204	1.776527487	1.600396337	10.92967868	11.23143802	4.418447748	5.174772829	7.976384214	9.703784616	10.93776907	9.331503041
W73406	2	2D Marker adult vs. fetal	1.145861617	1.588694122	1.394720158	1.5150059	1.348266115	1.257230067	7.903009948	8.279041624	2.830978933	2.857191738	4.639918605	4.149802613	3.608526999	4.719619102
R12002	1	2D Marker adult vs. fetal	0.754036384	0.456756191	2.051238469	1.123879939	0.741672703	6.551716983	0.238444224	0.16825892	1.58807476	0.822064291	7.205178124	0.257279583	0.444604195	1.264969688
AA405355	2	2D Marker adult vs. fetal	2.427316987	1.234497382	1.382975298	2.820706627	1.758025333	2.561266549	7.336819392	5.300937536	2.387694789	1.77122398	6.072708998	2.990994851	3.612925236	6.445676951
AA629363	1	2D Marker adult vs. fetal	0.627874118	0.361600207	0.637447262	0.608221718	0.513908343	0.712979229	9.713113247	10.66886848	10.54302042	11.03031161	8.843010597	9.775032469	9.586544135	5.681120215
AA629169	1	2D Marker adult vs. fetal	3.384460323	3.907165525	3.933343191	4.23836901	3.466746044	3.982435808	11.36797877	14.967791	4.768128161	7.170347339	9.57906376	11.61769875	10.65243229	8.340390966
AA430512	0	2D Marker adult vs. fetal	2.239479445	2.637756736	3.81876171	3.36943129	3.404540535	2.413395122	9.534573517	8.247853524	8.316348291	9.290581043	11.64863395	8.113650265	5.996962103	6.214691332
AA456439	0	2D Marker adult vs. fetal	3.838221727	2.779439139	4.396947269	4.325871481	4.445703612	3.414286314	10.70832344	10.50311685	10.50165717	9.291970768	11.97285965	10.03817061	8.954783916	6.730899031

H27864	0	2D Marker adult vs. fetal	4.083067399	2.598260193	3.247167731	3.682989494	4.052835461	3.076145132	9.780274543	10.17961553	7.795175273	9.32114728	10.79728456	9.655471293	7.995744552	7.171240518
AA644657	0	2D Marker adult vs. fetal	2.749565753	1.949529953	3.282718575	2.77240442	2.835386395	2.393138312	14.97773748	14.72866764	15.19497588	17.4722782	14.48792972	13.4943961	14.66848169	8.981574288
R40460	0	2D Marker adult vs. fetal	2.617741285	2.77044995	2.345768887	2.530348937	2.639132034	2.129569504	14.02006989	13.67189221	6.32559769	8.741499109	13.22962391	14.28706841	14.74331878	0.86098332
W96058	1	2D Marker adult vs. fetal	0.551793053	0.719935768	0.823172955	0.716948864	0.647054285	0.511406835	8.316574942	9.202396521	4.185436741	5.802080978	9.090198422	6.944350085	7.898182283	6.501582684
T72202	2	2D Marker adult vs. fetal	1.372133229	0.854777756	1.354496565	1.335828319	1.299146537	1.132910683	4.910901674	5.633601899	5.685609621	4.651309743	4.997212679	7.505442974	5.542126135	4.689359807
AA598794	3	2D Marker adult vs. fetal	0.857314271	0.38760124	4.60929041	4.449090919	3.2675415	0.950844105	0.573341181	8.49E-02	1.038303086	0.244900677	0.310786175	7.77E-02	0.048932125	0.163149057
AA599178	3	2D Marker adult vs. fetal	1.987500842	1.076238697	3.616532831	3.470498129	2.405945118	1.70047288	0.570691633	0.339390237	0.557633935	0.480744514	0.435231923	0.218741059	0.216046798	0.435225613
R98247	3	2D Marker adult vs. fetal	9.295559476	4.145659051	3.807036517	3.247695912	4.811556959	16.08933692	0.532639965	0.545118994	0.620081258	3.141140933	0.150055455	2.45E-02	1.85E-02	0.7022069
T98612	3	2D Marker adult vs. fetal	3.206007578	0.45582699	7.36008566	3.762388177	4.629393762	2.282352025	0.343184973	0.247595029	1.531771465	0.291419246	0.126481144	0.340974608	0.198086927	0.425481979
AA454858	3	2D Marker adult vs. fetal	7.687530164	3.130374276	3.770230181	3.357266094	3.90840295	11.3903699	0.223835364	0.266810127	0.814748607	0.353760373	0.103986984	3.73E-02	3.16E-02	0.245535865
N67048	2	2D Marker adult vs. fetal	0.182901012	0.39769394	0.297974786	0.30807128	0.27564065	0.333601513	10.14341863	7.592113899	4.344522356	3.851620223	4.536042504	6.665109387	5.008133377	7.16695928
AA778675	2	2D Marker adult vs. fetal	1.088783309	0.850650279	1.034076531	1.167561655	0.998364163	0.903409454	8.06934578	7.7581352	3.091038965	3.741665834	5.546996168	8.791259951	7.902378371	8.365452414
H51117	2	2D Marker adult vs. fetal	0.537932542	0.687368102	0.574022043	0.730299571	0.683526033	0.743361636	3.966369223	5.346765011	1.395463454	2.49073858	3.667011927	3.718900078	3.084623396	3.524676899
N36174	5	2D Marker adult vs. fetal	5.089061165	4.481415857	5.540191589	5.623320599	6.588429457	4.496005768	14.483682	13.54683348	11.11466575	11.63388016	14.05262104	12.75178351	11.89006855	9.330359142
AA777187	2	2D Marker adult vs. fetal	1.523155704	1.077976801	2.060524963	1.946327352	2.299471554	1.87592009	10.42303629	9.746871101	3.642022531	3.229088085	5.366152041	5.862550486	5.823237791	6.241060625
R09561	8	2D Marker adult vs. fetal	5.890519553	3.784033955	5.786281707	4.733579892	4.524489662	5.169772778	22.00681959	21.11752477	18.04191799	22.91566491	22.79559771	14.44791388	11.45011661	12.16487252
R16949	2	2D Marker adult vs. fetal	1.23979305	1.31739538	1.989966506	0.663751034	1.594500153	1.415959631	6.812396808	7.596990393	4.924342964	3.325162711	4.110023154	7.765585109	7.820823697	5.815135246
AA884167	2	2D Marker adult vs. fetal	1.217420137	0.76877689	0.848143007	1.070284972	1.102669725	1.097445419	4.188050396	4.749402103	1.61149811	2.749913448	4.2780267	4.100967576	3.815787701	4.055039882
AA136983	2	2D Marker adult vs. fetal	1.988298813	2.638681789	2.540675832	2.650969074	2.517626988	1.836297875	9.49585425	10.15056984	3.440351838	4.615880778	6.054186478	6.83657547	7.050636979	8.269159968
AA488622	2	2D Marker adult vs. fetal	1.834366714	2.664699416	2.916200392	2.716178444	2.280636291	1.670136989	9.890487467	9.836219264	3.473509988	3.789767104	6.282000648	8.049767975	6.973213882	8.212583544
AA699427	2	2D Marker adult vs. fetal	1.74393914	2.842651634	2.705734803	2.790851259	2.361629453	1.978094745	7.117192529	7.111662492	2.192838503	3.551786441	5.580591133	4.198944242	5.074757452	4.209708436
AA490459	3	2D Marker adult vs. fetal	6.36833046	5.671979458	3.680374244	4.938768805	4.884731709	9.255585154	2.575658166	3.736948711	0.933603593	1.465912184	1.758713261	1.104333244	0.867383654	1.531572668
AA626787	2	2D Marker adult vs. fetal	1.688259404	2.164212705	2.115946285	1.795197631	2.352850319	2.121107168	2.881272998	4.299097477	2.721322605	1.916839494	4.469467633	5.38359605	5.46846531	6.322351973
N62179	15	2D Marker adult vs. fetal	35.50826346	19.11160591	33.5269723	27.57938931	35.32468308	29.21398971	11.37102878	9.668317921	9.455248318	13.56398276	10.81112759	10.64826613	8.56567794	6.721636949
N27190	16	2D Marker adult vs. fetal	9.750993225	7.530891576	12.75918957	11.05916225	12.03535219	8.653835849	29.54707234	26.25035232	31.35383406	32.67661467	37.57564217	31.43271623	31.53461768	20.77058355
AA441895	16	2D Marker adult vs. fetal	7.177262564	5.235719613	7.385439482	7.014086953	8.126515643	6.246092446	24.27150375	22.9626093	26.60631666	36.88801888	40.06670353	29.78805939	34.54349576	17.24254068
AA463924	16	2D Marker adult vs. fetal	10.41970608	7.964616858	12.55072628	11.42665371	12.31290239	9.520621452	33.402247	33.69347601	35.571325	30.50800393	34.84762552	32.77696512	34.17207689	20.5248881
N78843	16	2D Marker adult vs. fetal	7.68464154	6.43569693	7.61347718	7.808367958	8.883600715	5.827918931	38.02091306	31.39298491	26.23461359	34.41711929	39.51187698	30.11933147	26.82888212	19.43620727
AA629719	16	2D Marker adult vs. fetal	14.07113881	8.07159282	15.07029688	13.18842124	13.89479922	12.78716552	31.48764197	37.41727747	31.54660297	39.60567516	40.1563207	39.38644198	30.25084933	26.0742679
AA464755	16	2D Marker adult vs. fetal	10.9079267	7.191687747	12.27393806	10.03671065	11.20438161	12.29601389	21.41973277	21.24106888	18.96936278	32.4046278	34.53593287	19.71196965	18.51583667	14.25627129
AA459351	7	2D Marker adult vs. fetal	3.307388816	5.313693676	7.122666851	3.529883953	3.671031365	4.776266565	1.833795538	2.618617925	1.373480533	1.256440944	1.67228768	2.914913803	2.591977948	3.899562773
AA488346	16	2D Marker adult vs. fetal	9.488691926	7.542950447	11.21693205	9.805337766	10.46454533	9.180810589	39.32983741	30.32593937	33.03970317	45.78348359	38.26709786	28.22982528	30.16564203	18.03374987
AA427899	17	2D Marker adult vs. fetal	13.3365169	9.041851128	16.97946166	12.44206045	15.16820039	11.53880939	28.67604716	25.76523385	30.14609328	28.85287545	35.98104596	35.22864254	36.82338782	23.94024054
AA453813	15	2D Marker adult vs. fetal	23.53014662	18.55051373	26.13232552	24.07754444	27.05702114	19.41666845	7.204336211	7.303817317	4.900254154	4.379972352	6.200941047	8.824169559	9.98471585	7.351059946
AA397824	15	2D Marker adult vs. fetal	26.08351962	20.62648968	27.02787269	26.29257303	30.85067131	19.80045327	10.76945162	7.982251483	7.560720116	7.432531006	9.754354143	9.514915642	7.935720221	5.920549076
AA633901	15	2D Marker adult vs. fetal	34.77984918	23.76442887	36.12250762	35.61488434	41.66703664	30.60345109	12.16200405	10.85306114	13.61633786	14.24924715	11.46202942	11.95459476	10.74415658	7.691587609
AA181334	15	2D Marker adult vs. fetal	27.28075277	18.98160489	31.18437988	27.23129085	29.89666189	24.05531978	9.69993387	10.26903792	7.998753206	7.736489526	8.536351201	10.14367035	10.00804431	6.84688358
AA292410	15	2D Marker adult vs. fetal	31.30959843	29.13821092	33.60796006	35.98378599	36.0810897	27.93817331	18.41498084	21.99567723	7.43645534	9.83113647	10.29990387	18.49023492	19.65621623	13.96412248
AA253434	15	2D Marker adult vs. fetal	27.28836746	24.48751872	26.021072	29.51377393	31.91897761	24.38068282	13.4092855	14.33475919	8.039460846	8.613564071	7.929641139	18.67319453	20.17449968	12.27802285
AA455056	16	2D Marker adult vs. fetal	12.54762444	10.90299499	12.04192978	13.96133559	14.93518352	10.87358414	29.82871509	29.27828702	14.29348739	29.3256109	37.85290764	27.56973365	34.99886458	17.91174019
R55188	21	2D Marker adult vs. fetal	31.12874965	12.81904882	26.29604395	18.72935308	27.16189534	19.64403686	53.79098202	48.27594503	54.21416245	67.09649695	78.87450563	52.63193562	55.51472182	23.62690499
AA485723	0	2D Marker adult vs. fetal	0.826099905	0.519829853	0.965056345	0.801834491	0.723063592	0.645073541	23.38181778	23.20566186	14.35096285	16.08639335	12.51504107	18.1389079	19.37029588	13.56503588
N49856	23	2D Marker adult vs. fetal	58.25496123	43.81206927	36.30704958	58.88107815	63.73545411	51.53609212	29.96970494	27.03519888	26.29856571	32.89736617	28.41338729	33.76040637	41.23242017	23.20296225
AA455272	23	2D Marker adult vs. fetal	78.7226545	67.95745288	36.30704958	70.83386123	84.60136833	54.29877782	23.70820419	24.87271063	17.74038543	15.81791403	21.42697241	25.95981278	30.31298784	20.80534628
AA459292	23	2D Marker adult vs. fetal	84.98013907	54.55237528	36.30704958	76.81031291	85.94545998	64.78113735	25.08753088	29.85942844	24.33982097	34.36597901	33.16899531	29.38762559	29.07865921	18.30430876
AA878581	23	2D Marker adult vs. fetal	91.89023489	70.24733836	36.30704958	85.95771786	103.4566248	54.83812392	29.70997223	36.1181983	42.41594013	29.19560183	37.16388231	29.60169992	29.15914586	1.513482669
AA772068	23	2D Marker adult vs. fetal	100.7022767	60.91386332	36.30704958	95.8034517	85.83154667	54.85301063	43.30930177	39.39007192	42.20898479	60.0670886	41.1840771	50.78509048	59.03512613	20.26604168
N76621	17	2D Marker adult vs. fetal	18.18260113	8.900969331	17.95988116	14.88223883	16.81550288	14.041252	31.19009514	31.82356739	34.25386088	37.21129787	43.16876807	28.5580241	29.24827598	16.3537237
AA291490	21	2D Marker adult vs. fetal	16.15200019	12.2559771	19.64085664	16.98965403	18.88134711	13.99432924	45.77501651	46.63476258	53.21442136	56.17239995	68.90492839	54.65064568	57.58008452	35.76767697
N46828	17	2D Marker adult vs. fetal	16.54096886	9.830784212	17.53351276	13.88763897	16.83874726	15.02548971	34.89731064	29.39427889	34.05249693	29.87758141	39.01685965	36.99188258	36.92808227	22.17775304
AA150487	21	2D Marker adult vs. fetal	15.19512412	13.80042191	17.95609277	14.5094678	17.55056275	15.10253571	45.34684386	44.65368856	55.30284844	57.55943944	67.07416778	40.42215172	41.79371663	27.72434403
AA282537	21	2D Marker adult vs. fetal	17.24244099	13.54870369	21.82923027	18.53902602	19.34433042	17.95537212	52.22535751	41.56388709	35.17403314	55.2750426	63.04486445	34.94861701	35.66047764	23.4061499
AA707922	21	2D Marker adult vs. fetal	29.52423481	19.17248102	30.42814242	29.09439668	27.854176	25.96066749	55.46799902	54.73165612	52.18006189	74.92853541	77.27931696	44.41763762	48.05902465	28.42806548
AA443638	20	2D Marker adult vs. fetal	15.1000594	15.16348782	17.68558853	15.7697112	18.94151907	14.51633105	47.23582949	41.25447374	31.90537257	20.13903587	55.94493635	32.20561704	43.85324507	23.97050394

W73892	19	2D Marker adult vs. fetal	53.62002013	39.02380555	36.30704958	58.67674826	53.62921611	46.25980911	20.27131765	22.07700187	17.82340994	12.42664249	13.03977036	19.26896493	19.76283359	12.52223224
N70734	19	2D Marker adult vs. fetal	50.1395528	37.01986341	36.30704958	48.48335304	47.57551429	45.25023946	16.00676831	16.21613077	13.02268984	13.77903964	9.864935148	16.31280635	19.12043735	10.93049868
H57136	13	2D Marker adult vs. fetal	10.27199646	9.124487788	12.5238108	9.80585148	11.12532179	10.90999218	23.62885337	23.14775485	17.64717904	22.5131702	27.62013988	19.25424118	19.11368361	16.68407949
AA709414	23	2D Marker adult vs. fetal	72.81271834	37.61546462	36.30704958	68.67343991	62.25292659	54.4411949	29.78740203	29.71153223	30.64738122	35.51331268	28.5320194	35.02888478	37.63023417	23.51979387
W65461	7	2D Marker adult vs. fetal	6.476639239	5.067442981	5.426667725	6.079126118	6.401464348	6.626362584	1.582316414	2.170422952	1.103228692	1.038420135	1.71524513	1.304498683	1.310369445	2.223501134
AA436564	15	2D Marker adult vs. fetal	23.02941313	15.24754038	25.73740515	22.61556954	22.7381159	19.61483801	9.362091141	8.134132036	6.780573609	9.12471574	10.01008974	10.0915921	7.199616962	5.462605703
AA029042	9	2D Marker adult vs. fetal	8.022234644	7.311596005	8.895662277	9.479217739	9.605485934	7.544837461	30.76692002	23.54804667	16.01970787	20.5027043	24.29218348	19.81870818	18.97220606	14.02066164
AA427725	9	2D Marker adult vs. fetal	12.69294864	7.555536142	13.67326812	4.261155334	12.4290971	12.61248352	24.1831519	26.60251328	23.95557184	27.67062775	19.53245951	29.94953555	31.50513283	19.26967868
N51280	9	2D Marker adult vs. fetal	6.632333815	5.874595041	7.385156272	7.526508106	7.785746506	6.983530521	27.65225851	31.81602093	10.9862251	15.87844468	22.5716942	31.13378929	33.56546319	0.278258082
AA281347	8	2D Marker adult vs. fetal	5.089780813	4.640487592	4.941559344	5.45251025	6.288204512	4.490066004	22.81574164	25.60885154	14.8674075	16.0671738	26.21817206	31.27308752	33.3028934	22.75939773
AA402960	8	2D Marker adult vs. fetal	4.965150621	4.50182924	6.596223821	2.242032928	4.880356596	4.839655851	24.41874925	26.11670313	18.18713636	19.51273882	24.56402722	27.14137043	33.29284839	22.8498167
N98485	9	2D Marker adult vs. fetal	7.125405927	6.644129951	7.7721664	7.556753899	9.479066808	6.411666818	23.15377588	21.24725903	20.03077128	16.99045362	21.34886081	15.26211932	16.22677894	11.5187422
AA490209	7	2D Marker adult vs. fetal	5.803194729	5.024903	4.546705412	6.046321655	6.500609214	4.920009122	3.035698537	2.915638696	1.659834641	1.10758798	2.258178208	2.051133108	1.835282947	3.040695852
W61301	9	2D Marker adult vs. fetal	7.384750912	7.335298925	11.10935518	8.81000027	9.421761776	6.881790584	34.10378478	31.17781956	34.01922951	29.43169864	23.02878278	44.28043077	49.3716344	30.55831089
N51018	7	2D Marker adult vs. fetal	5.486100802	38.59262312	10.6998308	6.032584588	5.216849242	17.32422488	0.895969739	0.822603424	8.791300555	6.668440211	0.397721776	0.485854727	0.500500102	3.973103928
AA455281	7	2D Marker adult vs. fetal	6.998082782	9.317433876	8.495460011	7.352959068	7.938571107	8.110370507	3.982933258	5.842816596	3.409051258	2.155743141	3.214957653	5.761751821	6.1678428	6.595859335
W69471	7	2D Marker adult vs. fetal	7.215022797	8.148565459	8.197656911	5.32000885	4.956859017	13.65485747	2.176145849	2.262871009	1.889011302	4.298069671	0.125110544	3.91E-02	4.41E-02	0.885776492
AA466321	7	2D Marker adult vs. fetal	6.616843406	3.608421667	10.1148224	5.538922361	5.404776773	6.062776617	1.034914616	1.422616774	15.19920754	7.415723464	1.525470041	1.404546396	1.733369861	4.163095485
AA458962	7	2D Marker adult vs. fetal	6.961286958	6.280975268	6.441469774	7.072922475	7.546598009	6.402438243	5.030129846	5.671175844	1.458266641	1.68375405	2.379536052	4.179216222	2.976132273	4.062391389
AA442095	7	2D Marker adult vs. fetal	10.53368667	6.969251828	9.035104314	8.530732052	8.715924875	7.353607298	4.829174413	4.815478182	3.252727167	3.668199484	2.608813532	4.180626657	3.959090691	3.356087801
N99003	7	2D Marker adult vs. fetal	7.777346527	6.123406597	7.271360835	7.694076299	8.015056524	6.947984869	2.039062485	2.563557284	1.92061982	1.456785844	2.0821831	1.985365512	1.595312179	1.552308165
AA609284	7	2D Marker adult vs. fetal	5.203527631	6.725226727	5.962252816	5.392872692	5.488984016	6.847332466	2.220425329	2.685924256	1.15451555	1.264654596	2.17588501	1.856888897	1.575172599	3.007772428
AA195036	12	2D Marker adult vs. fetal	4.739031812	5.630223489	6.168419327	3.952137125	6.299183958	4.511434885	31.39371467	32.51612495	19.8134056	22.2267943	29.07492798	24.93265482	25.96878567	17.40551632
AA478266	6	2D Marker adult vs. fetal	4.587623085	4.319668521	6.07446736	5.321094819	5.705783899	4.273131909	11.96015041	10.99922076	11.69181428	14.11437595	16.20593802	9.111161437	8.676545684	8.90313221
AA608583	13	2D Marker adult vs. fetal	8.710213419	6.633631914	10.89267006	9.697803204	10.76405611	7.594364628	30.64392285	26.66604793	25.63350539	30.51834358	30.33697466	24.55752432	28.90088593	20.25532036
AA460435	13	2D Marker adult vs. fetal	10.66603107	6.878393398	11.70702321	9.662860466	10.62920807	10.9035389	21.82366531	20.06896964	18.86262313	22.61456267	25.53193168	21.93073916	21.58624772	13.12039825
AA505045	13	2D Marker adult vs. fetal	6.175908969	7.774740452	10.84632581	7.657564613	7.632328468	5.432221512	23.63660096	22.05043745	23.18398426	18.65335782	26.21765542	23.90922453	31.7331025	17.36904023
AA487693	13	2D Marker adult vs. fetal	6.28913391	7.086629819	10.38317033	8.186637919	8.677781639	6.546527414	20.27570383	19.61886578	17.2329505	24.0071361	26.53431361	17.75212522	25.91589966	13.82120963
AA292220	12	2D Marker adult vs. fetal	8.978311765	9.498379167	9.999757753	8.245173408	8.45533271	7.944255354	48.60827655	42.38607553	23.18196775	29.16377551	30.35228689	41.74942514	54.37468138	30.13431188
H87106	9	2D Marker adult vs. fetal	8.511773188	8.306765068	8.639728411	8.688270747	9.817268292	7.409517924	20.63881132	19.57872959	14.95930266	17.92470933	21.26931436	23.98629793	22.76223035	16.76769736
W96450	12	2D Marker adult vs. fetal	6.333304604	6.11454974	10.93854816	8.295025536	8.501848685	6.781038425	23.07654727	21.55396988	24.36095954	29.19647166	31.37132599	30.73388527	31.10677394	21.79020976
H33331	13	2D Marker adult vs. fetal	12.01197758	9.753283045	14.0563162	10.92456794	13.45540044	19.89513482	28.36940167	25.78662125	25.65907432	25.90328811	29.92384688	26.86595169	28.03401198	23.03958218
AA405800	12	2D Marker adult vs. fetal	6.121396479	6.223320598	7.721500548	7.718106658	6.462547598	5.753462094	25.43365191	26.8056178	19.34783059	23.9119729	29.14739213	20.1376127	20.7481208	15.45920589
T51539	12	2D Marker adult vs. fetal	6.489900146	6.570558251	9.469029997	6.820284288	9.104419114	5.883142749	37.04254749	35.56329862	27.22357879	29.39443068	29.26747712	32.65179948	37.13241221	24.37523886
N59764	12	2D Marker adult vs. fetal	7.600540659	4.756724822	8.39191538	7.278906425	8.135204655	6.251234677	24.30305591	21.24727999	22.53923803	18.07436069	26.90427656	20.92597239	23.22437459	16.44600319
AA521346	11	2D Marker adult vs. fetal	18.0187463	11.98813991	20.04539147	17.86437285	19.72793582	15.44668568	3.927462453	4.483579541	4.871009817	6.009623654	4.220279818	6.412726238	6.63139433	4.36497316
AA428551	11	2D Marker adult vs. fetal	11.81378838	9.132344514	13.57703545	12.536771	14.28115078	11.3197892	7.511216326	7.054388812	6.360096859	6.387884337	4.74719124	11.79753397	11.80853014	8.624379722
AA469383	11	2D Marker adult vs. fetal	10.07198453	6.40710185	10.63654538	9.115267349	9.345806882	8.56845107	3.254207402	4.363727468	3.602198976	2.857452654	3.681140068	6.505644423	5.294681541	0.416074791
AA490172	11	2D Marker adult vs. fetal	8.374769147	1.415297485	17.39713256	12.09049918	8.290346893	6.184780432	8.583846144	2.818134848	16.5090439	6.336351989	4.552424226	5.084900048	1.540288648	5.753506895
AA504477	12	2D Marker adult vs. fetal	5.417891216	3.65972239	6.090353431	5.209247321	5.829042051	4.969815509	20.27058268	23.61171293	22.8431745	20.63453263	28.05090535	20.61037432	19.19136064	15.10292793

Claims

1. A method for the identification of tissue/cell specific marker genes comprising

a) taking tissue and/or cells of at least one developmental stage and/or at least one disease state, and/or

cultivating said tissue and/or cells *in vitro* under at least one culture condition,

b) determination of gene expression profiles of said tissue/cells and/or *in vitro* cultivated tissue/cells and

c) identification of specific marker genes by bioinformatic analysis of said gene expression profiles.

2. The method of claim 1 comprising cultivating tissue/cells of at least two different developmental stages and/or disease states *in vitro* under at least two different culture conditions, determination of gene expression profiles of said *in vitro* cultivated tissue/cells and identification of specific marker genes by bioinformatic analysis of said gene expression profiles.

3. The method of claim 1 or 2, wherein said tissue/cells are selected from the group consisting of fetal tissue, adolescent tissue, adult tissue, healthy tissue and pathological tissue, progenitor cells like stem cells or cells derived from the same precursor lineage.

4. The method of anyone of claims 1 to 3, wherein said culture conditions are 2D and 3D *in vitro* cultures.

5. The method of anyone of claims 1 to 4, wherein said gene expression profiles are determined by a micro-array.

6. The method of anyone of claims 1 to 5, wherein said bioinformatic analysis is done by software analysis like e.g. SOM or cluster analysis.

7. The method of anyone of claims 1 to 6 where the tissue is cartilage.

8. A method for the determination of a particular disease state or developmental status of cells/tissue or the physiological potential of

cells/tissue comprising establishing a gene expression profile of said cells or tissue, comparison of said resulting profile with profiles characteristic for a particular status or physiological potential of the examined cells/tissue and determination of the particular status of the examined tissue/cells.

9. The method of claim 8, wherein said profile is a gene expression profile which is determined by means of a micro-array.

10. The method of claim 8 or 9, wherein said tissue is cartilage tissue or chondrocytes, preferably derived from arthritic joint tissue (rheumatoid and osteoarthritis), and the micro-array comprises polynucleotide probes of tissue specific marker genes.

11. A method for the determination of characteristic gene expression profiles for clinical use comprising:

a) determining gene expression profiles of tissue or cell samples *in vitro* and generating a database containing said gene expression profiles,

b) correlating patient datas e.g. patient history, medication etc. of the tissue or cell sample donor with the gene expression profile of said tissue or cell samples and optionally the clinical outcome after treatment.

12. The method of claim 11, wherein said gene expression profile has been determined by a method of claims 8 to 10.

13. A cartilage array comprising a plurality of different polynucleotide probe spots stably associated with a solid surface of a carrier, whereby each of said spots is made of a unique polynucleotide that corresponds to one specific cartilage marker gene.

14. The cartilage array of claim 13 comprising at least two spots that have different nucleotide sequences but of the same cartilage marker gene.

15. The cartilage array of claims 13 or 14 comprising at least 10 spots of different nucleotide sequences and being indicative of a specific tissue or cell status.

16. The cartilage array of anyone of claims 13 to 15 comprising spots of different nucleotide sequences and that are indicative for at least two tissue or cell status, preferably 3 status.

17. The cartilage array of anyone of claims 13 to 16, wherein at least part of the cartilage marker genes is selected from the 467 genes listed in the description, preferably at least 10 %, more preferably at least 50 %, most preferably about 100 %.

18. The cartilage array of anyone of claims 13 to 17, wherein said different polynucleotides of the array do not cross hybridise under stringent conditions with each other.

19. The cartilage array of anyone of claims 13 to 18, wherein the status is selected from biopsies and/or 2D cultures and/or 3D cultures of healthy_adult,_healthy_fetal/infant,_undesired_adult,_undesired_fetal/infant_or progenitor cells like e.g. stem cell or cells derived from the same precursor lineage.

20. The cartilage array of anyone of claims 13 to 19, wherein the polynucleotide probes have a length of at least 10 nucleotides, preferably at least 25 nucleotides.

21. The cartilage array of anyone of claims 13 to 20, wherein the carrier is optionally attached to coated glass, nylon or any other material.

22. The cartilage array of anyone of claims 13 to 21, wherein at least part of the cartilage marker genes are selected from a subgroup of the 467 genes listed in the description, said subgroup consisting of the most tissue specific 200 genes.

23. The cartilage array of anyone of claims 13 to 22 which can be used within clinical applications as a diagnostic tool in order to assess patient biopsy/cell samples for targeted *in vitro* cell culture treatment/performance when performing a cell or tissue based therapy.

24. The cartilage array of anyone of claims 13 to 22 which can be used within clinical applications as a diagnostic tool in order to asses patient biopsy/cell samples and to decide on subsequent therapeutic approach which maybe a tissue engineered therapy, a cell therapy only, or even a traditional surgical approach only.

25. The cartilage array of anyone of claims 13 to 22 which can be used as a quality control tool in order to assess the quality of human biopsy/cell samples prior performing the cellular expansion in case of cell therapy and/or prior performing the differentiation/tissue formation in case of a tissue engineered therapy.

26. The cartilage array of anyone of claims 13 to 22 which can be used as a quality control tool in order to assess the quality of the final implant prior and/or after product release, said implant being proliferated cells in case of a cell therapy or tissue engineered cartilage in case of a tissue engineered therapeutic approach.

27. A kit for use in a hybridization assay comprising a cartilage array of anyone of claims 13 to 26.

28. The kit of claim 27, wherein said kit further comprises reagents for generating a labelled target polynucleotide sample, a hybridization buffer and a wash medium.

29. Use of a cartilage array or a kit of anyone of claims 12 to 28 for *in vitro* diagnostic of mammals, in particular humans.

Fig 1.

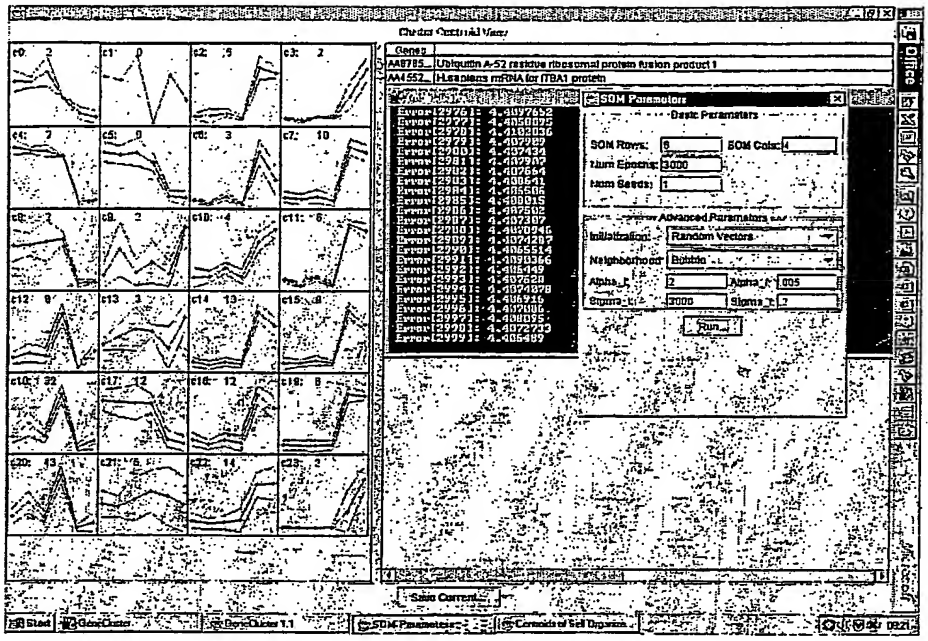
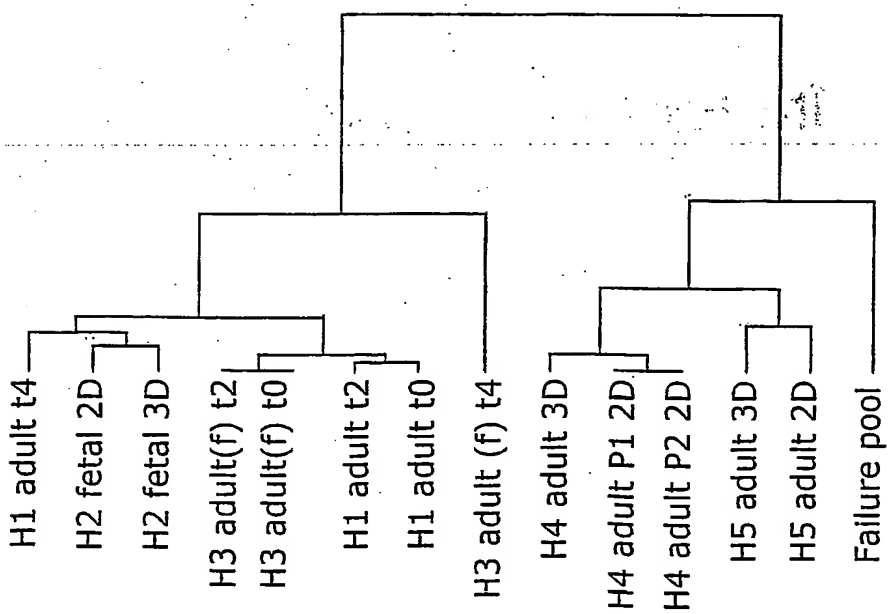


Fig 2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H2 fetal 2D
H2 fetal 3D
H3 adult(f) t2
H3 adult(f) t0
H1 adult t2
H1 adult t0
H3 adult (f) t4
H4 adult 3D
H4 adult P1 2D
H4 adult P2 2D
H5 adult 3D
H5 adult 2D
Failure pool

Fig 3

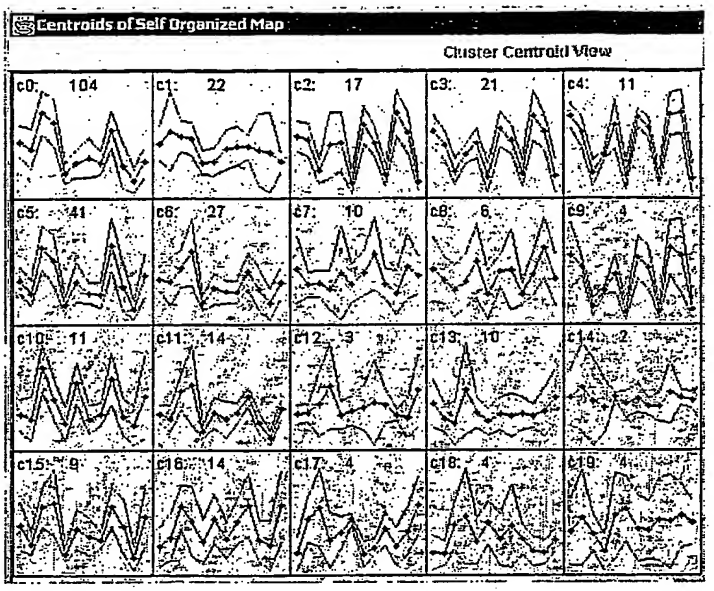
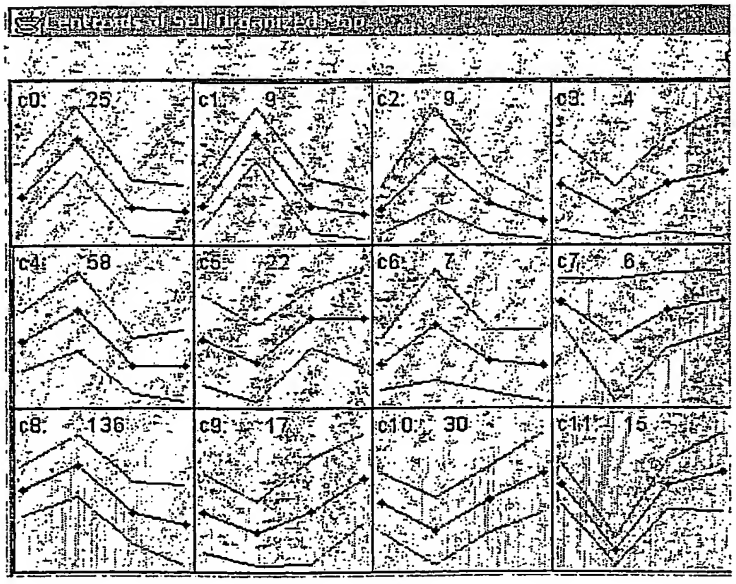

Centroids of Self Organized Map
Cluster Centroid View
c0: 104
c1: 22
c2: 17
c3: 21
c4: 11
c5: 41
c6: 27
c7: 10
c8: 6
c9: 4
c10: 11
c11: 14
c12: 3
c13: 10
c14: 2
c15: 9
c16: 14
c17: 4
c18: 4
c19: 4

Fig 4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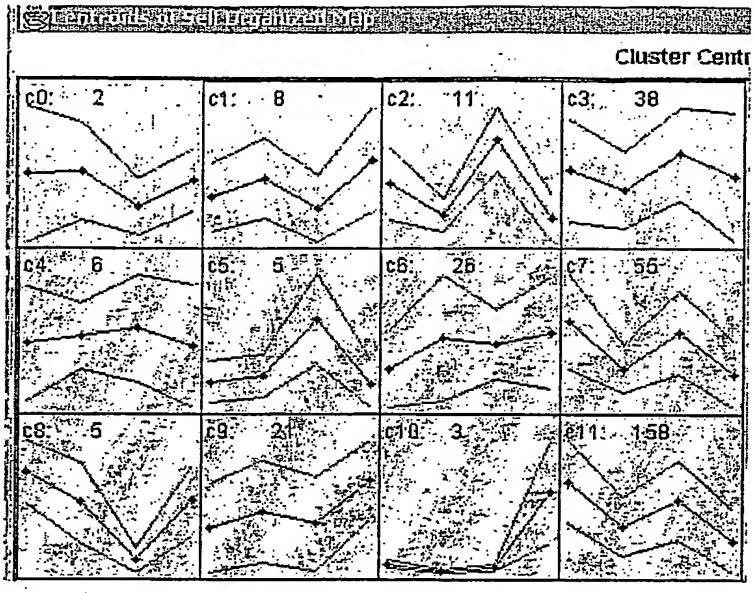
c2: 9
c3: 4
c4: 58
c5: 22
c6: 7
c7: 6
c8: 136
c9: 17
c10: 30
c11: 15

Fig 5


Cluster Centr
c0: 2
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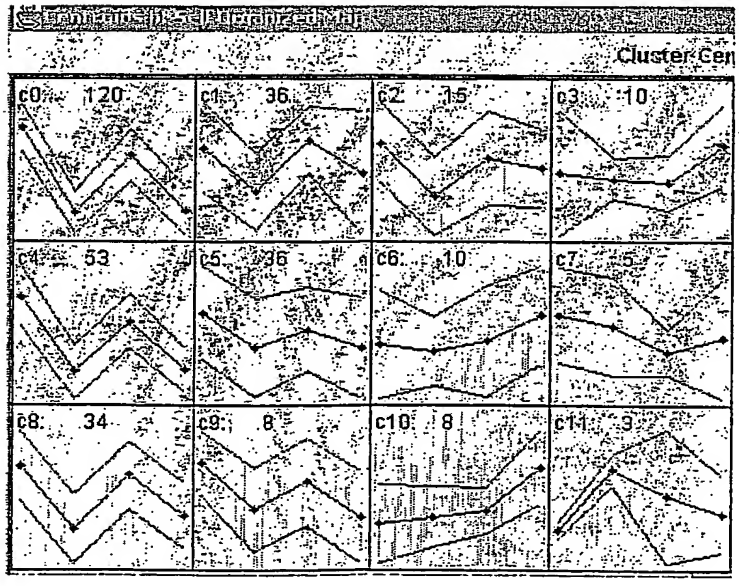
c2: 11
c3: 38
c4: 6
c5: 5
c6: 26
c7: 55
c8: 5
c9: 21
c10: 3
c11: 158

Fig 6


Cluster Cen
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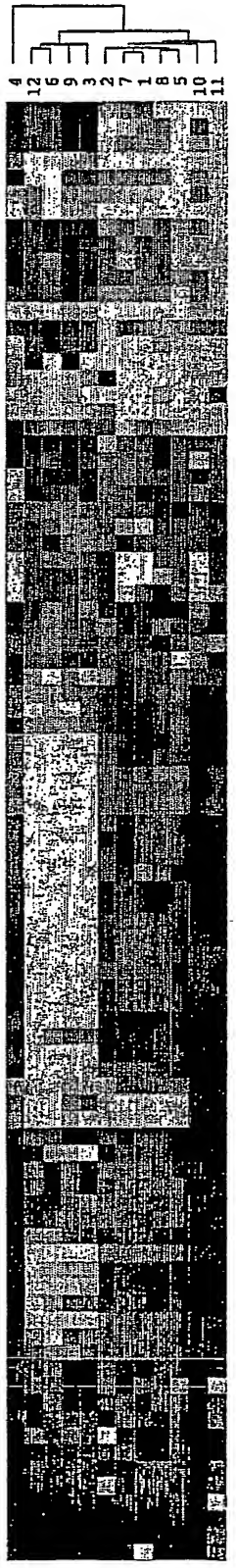
c6: 10
c7: 5
c8: 34
c9: 8
c10: 8
c11: 3

Fig 7



Homo sapiens mitogen activated protein kinase p38-2 mRNA, complete cds
Homo sapiens pancreatic polypeptide PPY, mRNA
Homo sapiens frizzled 1 mRNA, complete cds
Homo sapiens chondroadherin CHAD, mRNA
Human AMP deaminase AMPD3 mRNA, complete cds
H.sapiens Pur pur-alpha mRNA, complete cds
H.sapiens atk mRNA for agammaglobulinaemia tyrosine kinase
Homo sapiens heparan sulfate proteoglycan 2 perlecan HSPG2, mRNA
Homo sapiens integrin, beta 4 ITGB4, mRNA
Human S-lac lectin L-14-II LGALS2 mRNA, complete cds
Homo sapiens troponin I, skeletal, fast TNNI2, mRNA
Homo sapiens retinoic acid receptor responder tazarotene induced 2 RARRES2, Mrna
H.sapiens mRNA for PHAPI2b protein
Homo sapiens glutathione-S-transferase like; glutathione transferase omega GSTTLp28, mRNA
Homo sapiens biglycan BGN, mRNA
Homo sapiens mRNA for chondromodulin-I precursor, complete cds
Homo sapiens integrin, beta 2 antigen CD18 p95,
Homo sapiens matrix metalloproteinase 2 gelatinase A, 72kD gelatinase
Homo sapiens aggrecan 1 chondroitin sulfate proteoglycan 1
Homo sapiens creatine transporter mRNA, complete cds
Human mRNA for cone-specific cGMP phosphodiesterase gamma subunit, complete cds
H.sapiens mRNA for CLPP
Homo sapiens integrin binding protein Del-1 Del1 mRNA, complete cds
Homo sapiens tissue inhibitor of metalloproteinase 1 erythroid potentiating activity
Homo sapiens collagen, type II, alpha 1, COL2A1, transcript variant 2, mRNA
Homo sapiens transforming growth factor, beta-induced, 68kD TGFBI, mRNA
Human mRNA for eukaryotic initiation factor 4AI
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Homo sapiens matrix metalloproteinase 7 matrilysin, uterine MMP7, mRNA
Human alpha-1 type XI collagen COL11A1 mRNA, complete cds
Homo sapiens cytochrome c oxidase subunit VIIc COX7C, mRNA
Alpha tubulin
Homo sapiens transketolase Wernicke-Korsakoff syndrome TKT, mRNA
beta actin
Homo sapiens insulin-like growth factor 1 somatomedia C IGF1, mRNA
Human parathyroid hormone-related protein mRNA, complete cds
Homo sapiens chloride channel 7 CLCN7, mRNA
Homo sapiens RING zinc finger protein RZF mRNA, complete cds
Homo sapiens osteoclast stimulating factor mRNA, complete cds
Human B-cell leukemia/lymphoma 2 bcl-2 proto-oncogene mRNA encoding bcl-2-alpha protein
Human zinc-finger protein C2H2-150 mRNA, complete cds
Arabidopsis control oligo
Human focal adhesion kinase FAK mRNA, complete cds
Homo sapiens calpain 1, mu/I large subunit CAPN1, mRNA
Homo sapiens S-adenosylmethionine decarboxylase 1 AMD1, mRNA
Human frataxin FRDA mRNA, complete cds
Human cleavage and polyadenylation specificity factor mRNA, complete cds
H.sapiens COL10A1 gene for collegen alpha-1 type X
Homo sapiens G1 to S phase transition 1 GSPT1, mRNA
Homo sapiens matrix metalloproteinase 8 neutrophil collagenase MMP8, mRNA
Homo sapiens interleukin 3 colony-stimulating factor, multiple IL3, mRNA
Human cytochrome bc-1 complex core protein II mRNA, complete cds
Human ERK1 mRNA for protein serine/threonine kinase
Homo sapiens type 3 iodothyronine deiodinase mRNA, complete cds
Homo sapiens GTP-binding protein RHO6, mRNA
Human TATA-binding protein associated factor 30 kDa subunit tafII30 mRNA, complete cds
Homo sapiens integrin, beta 1 fibronectin receptor, beta polypeptide
Homo sapiens caspase 3, apoptosis-related cysteine protease CASP3, mRNA
Homo sapiens CD36 antigen collagen type I receptor
Homo sapiens integrin, alpha M complement component receptor 3, alpha
Human chromatin assembly factor-I p60 subunit mRNA, complete cds
Homo sapiens calponin 3, acidic CNN3, mRNA
Homo sapiens hypoxanthine phosphoribosyltransferase 1 Lesch-Nyhan syndrome HPRT1, mRNA
Human matrix Gla protein MGP mRNA, complete cds
Human connective tissue growth factor, complete cds
glyceraldehyde-3-phosphate dehydrogenase GAPDH mRNA
Human helix-loop-helix basic phosphoprotein G0S8 mRNA, complete cds
Homo sapiens fibrillin 1 Marfan syndrome FBN1, mRNA
Homo sapiens visinin-like 1 VSNL1,
Homo sapiens peptidylprolyl isomerase D cyclophilin D PPID, mRNA
Homo sapiens lysosomal hyaluronidase LUCA2/HYAL2 mRNA, complete cds
Homo sapiens MUF1 protein MUF1, mRNA
Homo sapiens glypican 1 GPC1, mRNA
Human somatostatin I gene and flanks
Homo sapiens integral membrane protein 2A ITM2A, mRNA
Homo sapiens group IIE secretory phospholipase A2 mRNA, complete cds
Homo sapiens small inducible cytokine A5 RANTES SCYA5, mRNA
Homo sapiens aggrecanase-2, ADAMTS5, mRNA
Human p21-activated protein kinase Pak1 gene, complete cds
Human insulin-like growth factor binding protein 6 IGFBP6 mRNA, complete cds
Homo sapiens ribosomal protein L30 mRNA, complete cds
Homo sapiens leukemia inhibitory factor cholinergic differentiation factor LIF, mRNA
Homo sapiens collagen, type VI, alpha 1 COL6A1, mRNA
Homo sapiens collagen, type XVIII, alpha 1 COL18A1, mRNA
Human phospholemman chloride channel mRNA, complete cds
Homo sapiens growth-arrest-specific protein gas mRNA, complete cds
Homo sapiens creatine kinase B mRNA, complete cds
Human mRNA for alpha1IX collagen long form

Fig 8

Human matrix Gla protein MGP mRNA, complete cds
Human helix-loop-helix basic phosphoprotein G0S8 mRNA, complete cds
Homo sapiens ribosomal protein L18 RPL18 mRNA, complete cds
Human vimentin gene, complete cds
Homo sapiens lumican LUM, mRNA
Human c-jun proto oncogene JUN, complete cds, clone hCJ-1
Homo sapiens mitochondrial coxII mRNA for cytochrome C oxidase II subunit
Human ribosomal protein S9 mRNA, complete cds
Homo sapiens mRNA for chondromodulin-I precursor, complete cds
Homo sapiens growth-arrest-specific protein gas mRNA, complete cds
Homo sapiens protein kinase C, beta 1 PRKCB1, mRNA
Homo sapiens platelet factor 4 PF4, mRNA
Human fibroblast growth factor-5 FGF-5 mRNA, complete cds
Human mitochondrial 1,25-dihydroxyvitamin D3 24-hydroxylase mRNA, complete cds
Homo sapiens integrin, beta 2 antigen CD18 p95, lymphocyte function-associated antigen 1
Homo sapiens integrin, alpha 2 CD49B, alpha 2 subunit of VLA-2 receptor ITGA2, mRNA
Human B-cell leukemia/lymphoma 2 bcl-2 proto-oncogene mRNA encoding bcl-2-alpha protein, complete cds
Human plectin PLEC1 mRNA, complete cds
Human focal adhesion kinase FAK mRNA, complete cds
Human gene for tumor necrosis factor TNF-alpha
Homo sapiens homeodomain protein BAPX1 mRNA, complete cds
Human parathyroid hormone-related protein mRNA, complete cds
Homo sapiens visinin-like 1 VSNL1,
Homo sapiens testis-specific Basic Protein Y 1 BPY1 mRNA, complete cds
Homo sapiens vascular cell adhesion molecule 1 VCAM1, transcript variant 2, mRNA
Homo sapiens a disintegrin-like and metalloprotease; aggrecanase-2 ADAMTS5, mRNA
Human Tat-SF1 mRNA, complete cds
Homo sapiens catechol-O-methyltransferase COMT mRNA, complete cds
Homo sapiens tensin TNS, mRNA
Homo sapiens heat shock 70kD protein 1B HSPA1B, mRNA
Homo sapiens MUF1 protein MUF1, mRNA
Homo sapiens mRNA for DNA-binding protein, complete cds
Human ADP/ATP translocase mRNA, 3' end, clone pHAT8
Homo sapiens collagen, type I, alpha 2 COL1A2, mRNA
Human mRNA for pro-alpha-1 type 3 collagen
Homo sapiens collagen, type XVIII, alpha 1 COL18A1, mRNA
Human phospholemman chloride channel mRNA, complete cds
Human checkpoint suppressor 1 mRNA, complete cds
Homo sapiens mRNA for protein phosphatase 2C gamma
Human hnRNP H mRNA, complete cds
Homo sapiens integrin, alpha L antigen CD11A p180
Homo sapiens frizzled 1 mRNA, complete cds
Human mRNA for alpha1IX collagen long form
Homo sapiens ribosomal protein L13 RPL13, transcript variant 1, mRNA
Homo sapiens eukaryotic translation initiation factor 5 EIF5, mRNA
Homo sapiens caspase 3, apoptosis-related cysteine protease CASP3, mRNA
Homo sapiens interleukin 6 interferon, beta 2 IL6, mRNA
Homo sapiens interleukin 8 IL8, mRNA
Homo sapiens decay accelerating factor for complement CD55, Cromer blood group system DAF, mRNA
Homo sapiens similar to chondroitin sulfate proteoglycan 2 versican H. sapiens LOC153633, mRNA
Homo sapiens eIF-2-associated p67 homolog mRNA, complete cds
Homo sapiens troponin I, skeletal, fast TNNI2, mRNA
Human p37NB mRNA, complete cds
Homo sapiens creatine kinase B mRNA, complete cds
H.sapiens P1-Cdc46 mRNA
Human Smad1 mRNA, complete cds
Homo sapiens integrin, beta 1 fibronectin receptor, beta polypeptide, antigen CD29 includes MDF2
Human cytoskeleton associated protein CG22 mRNA, complete cds
Alpha tubulin
Homo sapiens matrix metalloproteinase 1 interstitial collagenase MMP1, mRNA
Homo sapiens chloride channel 7 CLCN7, mRNA
Homo sapiens RING zinc finger protein RZP mRNA, complete cds
Human pancreatic elastase IIA mRNA, complete cds
Homo sapiens regulator of G-protein signalling 4 RGS4, mRNA
Human L2-9 transcript of unrearranged immunoglobulin VH5 pseudogene
Human HLA-DMB mRNA, complete cds
Human putative tumor suppressor LUCA15 mRNA, complete cds
H.sapiens mRNA for VEGF-C protein
Human profilin mRNA, complete cds
Homo sapiens matrix metalloproteinase 3 stromelysin 1, progelatinase MMP3 gene, complete cds
Homo sapiens transforming growth factor, beta-induced, 68kD TGFBI, mRNA
Homo sapiens tissue inhibitor of metalloproteinase 1 erythroid potentiating activity, TIMP1, mRNA

Fig 9

Homo sapiens integral membrane protein 2A ITM2A, mRNA
Homo sapiens small inducible cytokine A5 RANTES SCYA5, mRNA
Human ERK1 mRNA for protein serine/threonine kinase
Homo sapiens fibromodulin FMOD, mRNA
Homo sapiens collagen alpha 3 type IX COL9A3 mRNA, complete cds
H.sapiens dermatopontin mRNA, complete CDS
H.sapiens mRNA for leucine zipper protein
Homo sapiens fibronectin 1 FN1, mRNA
glyceraldehyde-3-phosphate dehydrogenase GAPDH mRNA, complete cds
Human mRNA for pro-alpha-1 type 3 collagen
phospholipase A2
Human alpha-1 type XI collagen COL11A1 mRNA, complete cds
Homo sapiens collagen, type II, alpha 1 primary osteoarthritis, spondyloepiphyseal dysplasia
Homo sapiens ATPase, Cu++ transporting, beta polypeptide Wilson disease ATP7B, mRNA
Homo sapiens homolog of the Aspergillus nidulans sudD gene product mRNA, complete cds
Homo sapiens cadherin 11, type 2, OB-cadherin osteoblast CDH11, transcript variant 1, mRNA
Homo sapiens cathepsin B CTSB, mRNA
Homo sapiens decorin DCN, mRNA
Homo sapiens SRY sex determining region Y-box 9 campomelic dysplasia
Human ribosomal protein S9 mRNA, complete cds
Homo sapiens nuclear autoantigenic sperm protein histone-binding NASP, mRNA
H.sapiens mRNA for Sop2p-like protein
Homo sapiens calpain 1, mu/I large subunit CAPN1, mRNA
Homo sapiens defender against cell death 1 DAD1, mRNA
Homo sapiens caspase 9, apoptosis-related cysteine protease CASP9, transcript variant alpha, mRNA
Human AMP deaminase AMPD3 mRNA, complete cds
Homo sapiens mRNA for leukemia associated gene 1
Homo sapiens pancreatic polypeptide PPY, mRNA
Homo sapiens msh homeo box homolog 2 Drosophila MSX2, mRNA
Homo sapiens creatine transporter mRNA, complete cds
Human cytoskeleton associated protein CG22 mRNA, complete cds
Homo sapiens collagen, type I, alpha 1 COL1A1, mRNA
Homo sapiens S-adenosylmethionine decarboxylase 1 AMD1, mRNA
H.sapiens mRNA for RIT protein
H.sapiens Pur pur-alpha mRNA, complete cds
Homo sapiens talin 1 TLN1, mRNA
Homo sapiens phosphatase and tensin homolog mutated in multiple advanced cancers 1 PTEN, mRNA
Homo sapiens peptidylprolyl isomerase D cyclophilin D PPID, mRNA
Homo sapiens matrix metalloproteinase 7 matrilysin, uterine MMP7, mRNA
Homo sapiens phosphoenolpyruvate carboxykinase 1 soluble PCK1, mRNA mRNA carboxykinase 1 soluble
Homo sapiens RING zinc finger protein RZF mRNA, complete cds
Homo sapiens RPL6 gene for ribosomal protein L6, complete cds
Homo sapiens cartilage oligomeric matrix protein pseudoachondroplasia, epiphyseal dysplasia 1
Homo sapiens ribosomal protein L18 RPL18 mRNA, complete cds
Homo sapiens hexabrachion tenascin C, cytotactin HXB, mRNA
Homo sapiens biglycan BGN, mRNA
Homo sapiens bone morphogenetic protein 6 BMP6, mRNA
Homo sapiens osteoclast stimulating factor mRNA, complete cds
Homo sapiens collagen, type I, alpha 2 COL1A2, mRNA
Human tropomodulin mRNA, complete cds
Human insulin-like growth factor binding protein 5 IGFBP-5 mRNA, complete cds
Homo sapiens bone morphogenetic protein 9 BMP9 mRNA, complete cds
Homo sapiens ATP synthase, H+ transporting, mitochondrial F1 complex, delta subunit ATP5D, mRNA
Homo sapiens interleukin 6 interferon, beta 2 IL6, mRNA
Homo sapiens cyclin D1 PRAD1: parathyroid adenomatosis 1 CCND1, mRNA
Homo sapiens platelet factor 4 PF4, mRNA
Homo sapiens integrin, beta 2 antigen CD18 p95, lymphocyte function-associated antigen 1
Homo sapiens tissue inhibitor of metalloproteinase 1 erythroid potentiating activity, TIMP1
Human tax1-binding protein TXBP181 mRNA, complete cds
Homo sapiens lipase A, lysosomal acid, cholesterol esterase Wolman disease LIPA, mRNA
Homo sapiens transketolase Wernicke-Korsakoff syndrome TKT, mRNA
Homo sapiens matrilin 1, cartilage matrix protein MATN1, mRNA
Homo sapiens GTP-binding protein RHO6, mRNA
Homo sapiens leukemia inhibitory factor cholinergic differentiation factor LIF, mRNA
Homo sapiens vascular cell adhesion molecule 1 VCAM1, transcript variant 2, mRNA
Homo sapiens growth-arrest-specific protein gas mRNA, complete cds
Homo sapiens mitogen activated protein kinase p38-2 mRNA, complete cds
Human transcription factor IL-4 Stat mRNA, complete cds
Human insulin-like growth factor binding protein 6 IGFBP6 mRNA, complete cds
Homo sapiens FOS-like antigen 1 FOSL1, mRNA
Homo sapiens integrin, beta 4 ITGB4, mRNA
Human putative tRNA synthetase-like protein mRNA, complete cds
Human mRNA for retinol binding protein RBP
Homo sapiens tissue inhibitor of metalloproteinase 2 TIMP2, mRNA
Homo sapiens collagen, type V, alpha 1 COL5A1, mRNA

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Published:
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(54) Title: IDENTIFICATION OF SPECIFIC MARKER GENES AND USE THEREOF

(57) Abstract: A cartilage array comprises a plurality of different polynucleotide probe spots stably associated with a solid surface of a carrier, whereby each of said spots is made of a unique polynucleotide that corresponds to one specific cartilage marker gene. Said specific cartilage marker genes preferably are at least in part selected from a group of 467 genes that could be shown to be cartilage related.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CH 03/00379

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C12Q1/68

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C12Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, BIOSIS, EMBASE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BENZ ET AL.: "Molecular analysis of expansion, differentiation, and growth factor treatment of human chondrocytes identifies differentiation markers and growth-related genes" BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS, vol. 293, no. 1, 26 April 2002 (2002-04-26), pages 284-292, XP002256352 the whole document ----- -/--	1-12

[X] Further documents are listed in the continuation of box C.

[ ] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 October 2003	16. 01. 2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bort, S

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CH 03/00379

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	STOKES ET AL.: "Assessment of the gene expresion profile of differentiated and dedifferentiated human fetal chondrocytes by microarray analysis" ARTHRITIS AND RHEUMATISM, vol. 46, no. 2, February 2002 (2002-02), pages 404-419, XP002253145 the whole document	1-12
X	SCHNABEL ET AL.: "Dedifferentiation-associated changes in morphology and gene expression in primary human articular chondrocytes in cell culture" OSTEOARTHRITIS AND CARTILAGE, vol. 10, no. 1, January 2002 (2002-01), pages 62-70, XP002253146 the whole document	1-12
X	MARLOVITS ET AL.: "Differential gene-expression of human articular chondrocytes and human fibroblasts in two- and three-dimensional cell culture" FASEB JOURNAL, vol. 15, no. 4, 7 March 2001 (2001-03-07), page A34, XP008021552 the whole document	1-12
X	ISLAM ET AL.: "Expression profile of protein tyrosine kinase genes in human osteoarthritis chondrocytes" OSTEOARTHRITIS AND CARTILAGE, vol. 9, 2001, pages 684-693, XP002253148 the whole document	1-12
A	KURELLA ET AL.: "DNA microarray analysis of complex biologic processes" J AM SOC NEPHROL, vol. 12, 2001, pages 1072-1078, XP002253149 the whole document	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CH 03/00379

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-12

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12

Invention 1

A method for the identification of tissue/cell specific marker genes; a method for the determination of a particular disease state or developmental status or the physiological potential of cell/tissue; and a method for the determination of characteristic gene expression profiles for clinical use

---

2. claims: 13-29 (all partially)

Inventions 2-468

An array comprising a human chondrocyte specific gene; a kit comprising it; and the use of said gene or kit for in vitro diagnostic of mammals, in particular humans,

wherein said human chondrocyte specific gene is that corresponding to the Pubmed accession numbers listed in table II:
-for invention 2: AA283693

-for invention 3: AA845156

-for inventions 4-468: R52548-AA504477
